Financing of HIV/AIDS programme scale-up in low-income and middle-income countries, 2009–31

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As the global HIV/AIDS pandemic nears the end of its third decade, the challenges of efficient mobilisation of funds and management of resources are increasingly prominent. The aids2031 project modelled long-term funding needs for HIV/AIDS in developing countries with a range of scenarios and substantial variation in costs: ranging from US$397 to $722 billion globally between 2009 and 2031, depending on policy choices adopted by governments and donors. We examine what these figures mean for individual developing countries, and estimate the proportion of HIV/AIDS funding that they and donors will provide. Scenarios for expanded HIV/AIDS prevention, treatment, and mitigation were analysed for 15 representative countries. We suggest that countries will move in increasingly divergent directions over the next 20 years; middle-income countries with a low burden of HIV/AIDS will gradually be able to take on the modest costs of their HIV/AIDS response, whereas low-income countries with a high burden of disease will remain reliant upon external support for their rapidly expanding costs. A small but important group of middle-income countries with a high prevalence of HIV/AIDS (eg, South Africa) form a third category, in which rapid scale-up in the short term, matched by outside funds, could be phased down within 10 years assuming strategic investments are made for prevention and efficiency gains are made in treatment.

Introduction

Overall spending on HIV/AIDS in low-income and middle-income countries increased from around US$1·4 billion in 2000 to $13·7 billion in 2008.[1] This rapid and unprecedented expansion has led to many important gains. More than 4 million people with HIV-1 infection are now receiving life-saving antiretroviral therapy (ART).[2] Globally, the incidence of HIV infection has reduced 30% from a peak in the mid-1990s.[3] Some countries, such as Cambodia, Dominican Republic, Tanzania, and Uganda, have seen substantial declines in incidence.[4]

Despite these gains, additional large increases in spending for prevention and treatment of HIV will be needed to control the epidemic in the future. Without a revolutionary prevention technology such as an effective vaccine or a curative drug therapy, effective prevention methods such as male circumcision, condom use, needle exchange, and prevention of mother-to-child transmission need to be expanded further, requiring increased financial outlays.

At the same time, demand for ART for adults and children with HIV infection will continue to grow rapidly. In 2009, a million extra people received ART, but 5·5 million of 9·5 million people in need of treatment worldwide did not.[2] Furthermore, because the 2009 WHO guidelines recommend earlier initiation of ART, the number of people classified as in need of treatment will increase by almost half.[5]

The intensifying situation raises a series of difficult questions for domestic and international financing of HIV/AIDS efforts. HIV/AIDS is a long-term problem and not a short-term crisis. Key long-term financing issues for governments of low-income and middle-income countries and their external funder partners include: how large will the resource requirements be to combat HIV/AIDS effectively over the next 20 years, globally and for countries? Given the range of imaginable scale-up scenarios, will countries succeed in controlling their epidemics, and what benefits will they get from increased spending, as measured by infections averted and lives saved? What share of the funding will individual developing countries be able to contribute, and what can be expected from external donor agencies?

Some responses to these questions at the global scale have been reported by the aids2031 project,[6] but country-by-country estimates have not been made. We briefly discuss global results and examine the long-term cost of HIV/AIDS and financing prospects for selected countries.

For ***The Lancet*** **Series on HIV Prevention** see http://www.thelancet.com/series/hiv-prevention

For the **2008 XVII International AIDS Conference** see http://www.aids2008.org/

Global results

In 2009, the aids2031 costs and financing working group modelled the long-term financial requirements for strengthening of prevention, treatment, mitigation, and related health systems for all low-income and middle-income countries in 2009–31.[7] Financial needs were projected with four scenarios (current trends, rapid scale-up, hard choices, and structural change) with various assumptions about future political will, available resources, and strategic approaches. The four scenarios encompass a combination of feasible policy options, but are only a subset of the wide range of possible scenarios, including pessimistic and optimistic ones (panel).

For every scenario, we estimated the effect of intervention scale-up on HIV incidence and prevalence, AIDS mortality, and the number of people on treatment. We calculated the costs of the scenarios on the basis of coverage and unit costs of every intervention. Details of our methods and results are reported elsewhere.[6]

The results from our projections are sobering (table 1). Resource needs for HIV/AIDS in low-income and middle-income countries are projected to increase to $18·5–35·3 billion per year by 2031, in the absence of a major breakthrough such as a vaccine or cure. In 22 years,

Panel: aids2031 costs and financing scenarios

Current trends

Coverage of key interventions expands to 2015 as it did in the previous few years. As a result, countries achieve their universal access goals (coverage targets announced by countries in 2005) for some services but not others, and some countries do not achieve universal access by 2015.

Rapid scale-up

Political will is strong and resource availability continues to grow rapidly. The emphasis rests on scaling up direct approaches for prevention of HIV-1 transmission and provision of care and support. Countries achieve their targets for key prevention, care, treatment, and support services for orphans and vulnerable children by 2015 and continue at the same rate to 2031. Universal access is generally defined as 60–80% coverage, with the exception of school programmes, blood safety, and safe medical injections, for which the target is 100% coverage.

Hard choices for prevention

Resources for HIV/AIDS programmes are restricted, so there is a focus on scaling up only the most cost-effective approaches for prevention. A greater emphasis is placed on programmes for the most at-risk-populations (sex workers, men who have sex with men, and injecting drug users) than on general population interventions such as workplace programmes and community mobilisation, particularly in small-scale and concentrated epidemics.

Structural change

Because HIV/AIDS is a long-term problem, in structural change there is a greater emphasis on structural actions that can reduce vulnerability to HIV/AIDS and produce a more sustainable response than there is in the other scenarios. This response might include programmes to reduce violence against women, modify employment practices that lead to the separation of workers and their families, and remove legal and other stigma-related barriers.[8]

See online webappendix for more on these scenarios, including coverage rates.

total outlays are estimated to amount to $397–722 billion. Two thirds of this amount would be needed in Africa alone.

Results from the global analysis show that policy choices made in the next few years will have a large effect on the course of the epidemic. The rapid scale-up scenario, including a widespread effort to achieve universal access to prevention and treatment services by 2015, would prevent about 7 million more deaths and 14·2 million more infections than would the current trends scenario. Rapid scale-up would cost $232 billion more than would current trends. Presently, when countries and donors are coping with the aftermath of global recession, rapid scale-up is increasingly improbable, especially as it requires a rise in HIV/AIDS spending from $15 billion in 2009 to more than $30 billion per year by 2013.

If prevention efforts were concentrated on few interventions that were known to be cost-effective and were targeted to high-risk populations (the hard choices scenario), total costs in the 22 years could be $325 billion less than they would be with rapid scale-up and $93 billion less than with current trends (table 1). Cumulative AIDS-related deaths would be slightly higher (~1 million [2·6%] more deaths) than with rapid scale-up, but would be much lower (6 million [13·3%] fewer deaths) than with current trends. The hard choices approach achieves the most cost-effective results for prevention.

Although hard choices is the most economical option for curbing of the epidemic, we project that investment in structural change would have the greatest effect for reduction of future spread of the infection. However, even with this best-case scenario, in which countries tackle the underlying social determinants of HIV/AIDS (eg, gender-based violence, stigma, and discrimination), the numbers of adults who become infected in 2031 will still be around 1·2 million, meaning that even under the best circumstances there will be a persisting epidemic in 2031, 50 years after the emergence of HIV/AIDS. Structural change would require $579 billion by 2031, which is more than would be needed for hard choices but is lower than for rapid scale-up. However, many of the structural interventions (eg, prevention of gender-based violence) have benefits beyond HIV/AIDS, and so costs could be shared.

With current trends, the projected number of new HIV infections in 2031 is 2·1 million, which is comparable to the situation today. With the old WHO guidelines for treatment eligibility, the projected number of people receiving ART rises rapidly between 2010 and 2015, and continues to grow modestly to 2–3-fold the number of

See Online for webappendix

	Cumulative resources required, US$ billions	Cumulative life-years gained, millions	Cumulative deaths from AIDS, millions	Cumulative adult* HIV-1 infections, millions	Resources required per year, US$ billions (2031)	Number of people on ART, millions (2015)	Number of people on ART, millions (2031)	Number of new HIV-1 infections, millions (2031)
Current trends	490	148	45	47·5	23·7	8·8	10	2·1
Rapid scale-up	722	235	38	33·3	35·3	11·6	13	1·3
Hard choices	397	232	39	39·4	18·5	11·3	13·2	1·7
Structural change	579	99	44·5	36·4	31·9	5·7	8·6	1·2

ART=antiretroviral therapy. *Older than 15 years.

Table 1: **Results of aids2031 global modelling, 2009–31**

	2008					2015					2030				
	Prevalence of HIV (%)	GDP per head (US$)*	HIV/AIDS expenditure			Prevalence of HIV (%)	GDP per head (US$)	HIV/AIDS expenditure			Prevalence of HIV (%)	GDP per head (US$)	HIV/AIDS expenditure		
			Per head (US$)	% of THE	% of GDP			Per head (US$)	% of THE	% of GDP			Per head (US$)	% of THE	% of GDP
South Africa	18·31%	3946·48	32·32	9·84%	0·82%	19·25%	5193·50	58·45	13·40%	1·13%	17·92%	8992·34	64·29	8·36%	0·71%
Zambia	15·25%	401·44	23·97	111·52%	5·97%	13·13%	530·05	34·10	118·94%	6·43%	7·90%	915·15	32·58	64·49%	3·56%
Mozambique	12·63%	336·01	11·83	86·34%	3·52%	12·16%	493·38	29·61	145·12%	6·00%	8·04%	1198·32	29·54	57·80%	2·47%
Kenya	6·99%	512·73	11·39	51·98%	2·22%	5·72%	627·23	22·88	84·60%	3·65%	3·17%	921·26	23·10	57·26%	2·51%
Uganda	5·46%	293·74	8·20	42·29%	2·79%	3·80%	353·50	14·08	59·72%	3·98%	1·60%	550·08	11·95	31·81%	2·17%
Cameroon	4·97%	781·71	6·32	15·80%	0·81%	3·78%	898·12	16·67	36·02%	1·86%	1·87%	1233·83	14·61	22·63%	1·18%
Nigeria	3·11%	522·40	3·66	19·02%	0·70%	2·64%	673·64	11·02	44·00%	1·64%	1·54%	1137·41	10·96	25·33%	0·96%
Ukraine	1·57%	1172·12	1·76	2.19%	0·15%	1·65%	1817·02	6·04	4·79%	0·33%	1·84%	4331·75	5·93	1·93%	0·14%
Thailand	1·38%	2778·56	3·70	3·95%	0·13%	1·06%	3488·65	3·82	3·23%	0·11%	0·59%	5179·42	2·78	1·56%	0·05%
Cambodia	0·86%	512·09	3·20	10·98%	0·62%	0·56%	813·79	5·04	10·73%	0·62%	0·23%	1903·40	4·78	4·22%	0·25%
Brazil	0·61%	4009·98	3·52	1·14%	0·09%	0·57%	4565·80	4·06	1·15%	0·09%	0·50%	5650·16	3·80	0·86%	0·07%
Vietnam	0·52%	660·71	0·84	2·29%	0·13%	0·55%	963·34	3·09	5·68%	0·32%	0·58%	1821·71	3·10	2·95%	0·17%
Mexico	0·33%	6320·15	6·99	1·77%	0·11%	0·34%	7009·45	9·16	2·08%	0·13%	0·34%	8017·57	8·16	1·61%	0·10%
India	0·32%	727·21	0·56	1·68%	0·08%	0·23%	1089·67	2·16	4·23%	0·20%	0·13%	2387·86	2·10	1·83%	0·09%
China	0·10%	1930·06	0·42	0·51%	0·02%	0·15%	3277·47	3·46	2·42%	0·11%	0·19%	9002·48	3·19	0·79%	0·04%

Unless otherwise stated, data were calculated on the basis of the rapid scale-up scenario.[12] Prevalence data are for adults aged 15–49 years. THE=total health expenditure. *Based on World Bank GDP estimates.

Table 2: **Projected HIV/AIDS prevalence and expenditure in 2008, 2015, and 2030**

patients on treatment today by 2031 (table 1). If the new WHO treatment eligibility guidelines were used, projected numbers on treatment would be 53% higher and corresponding costs 43% greater than are reported here.[9]

If, because of the economic crisis, HIV/AIDS prevention and treatment funding were to remain flat at 2009 rates in all countries for the next 20 years, our modelling suggests that the number of new adult HIV infections would rise from 2·3 million in 2009 to 3·2 million in 2015. This prediction emphasises the inherent danger in allowing HIV/AIDS financing to stagnate in the coming years—especially if there is no breakthrough prevention technology—and underlines the importance of renewed efforts to make HIV/AIDS spending more efficient.

In our global model,[10] we explored the effect of potential new technologies for prevention of HIV transmission. We assessed microbicides[11] and pre-exposure prophylaxis, which might be available by 2015; HIV vaccines, which might be available after 2015; and curative treatment, which has unknown feasibility. Implementation strategies for microbicides and pre-exposure prophylaxis could lead to a decline in new infections of 5–25%, depending on the type of epidemic. However, substantial reductions in incidence (≥50%) will only occur with introduction of a vaccine or curative treatment.

Country projections

Global modelling projections can help us to understand the persisting nature of the HIV/AIDS epidemic and the need for action, including targeted prevention that is rapidly scalable and cheap, and renewed efforts to find improved prevention technologies such as pre-exposure prophylaxis, microbicides, vaccine, or cure. However, some of the most striking outcomes of aids2031 were the projections for individual countries. The global pandemic is heterogeneous, with different subepidemics occurring across and within countries. In the long term, our modelling suggests that these epidemiological differences and costs will become more pronounced.

For the same four scenarios as aids2031, we created projections for geographically and epidemiologically representative low-income and middle-income countries (table 2). We noted two broad groups of countries. One group had a high burden of HIV/AIDS (generalised epidemics and adult prevalence >5%) and typically low incomes (GDP <$800 per head in 2008). The second group had a low burden of HIV/AIDS (typically <1% adult prevalence, occurring in high-risk subpopulations) and mostly middle incomes (mean GDP $2264 per head in 2008). South Africa and several of its neighbours (Botswana, Namibia, and Swaziland) form a small third group, combining high disease burden with middle income status.

The financial resources needed in 2008 for rapid scale-up exceeded 2% of GDP in all high-burden, low-income (HBLI) countries, apart from Cameroon, and was nearly 6% of GDP in Zambia (table 2). By 2015, we project that these heavy financial requirements will increase even further in all these countries, growing by more than half again as compared with 2008 in Kenya and Mozambique, and more than doubling in Nigeria to nearly 2% of GDP (figure). HIV/AIDS spending requirements for 2008 in

these countries was a large proportion of health expenditure (table 2), emphasising the severe pressure that HIV/AIDS places on available resources. In response to this pressure, HBLI countries have had to rely heavily on external financing for their HIV/AIDS programmes, including grants from the US President's Emergency Plan for AIDS Relief (PEPFAR) and the Global Fund to Fight AIDS, Tuberculosis and Malaria.

The unprecedented situation experienced by HBLI countries is unlikely to improve in the next few years. Continued high HIV incidence means spending needs will escalate in the next 5–8 years, especially as ART programmes expand to meet unmet need with the WHO expanded treatment guidelines. As a share of GDP, total HIV/AIDS spending in 2008–15 will grow by 1·4% in Kenya, 2·5% in Mozambique, and 0·4% in Zambia (table 2). Even as we approach the 2015 deadline for the Millennium Development Goals, many HBLI countries are in fact moving farther away from the goal of halting and reversing the AIDS epidemic. Financial competition and potential crowding out from HIV/AIDS will also be severe; in Zambia, for example, the projected HIV/AIDS spending of $34 per head in 2015 is greater than is the total expected per-person health outlay. With rapid scale-up, HIV/AIDS spending in 2031 is estimated at 1–3% of the GDP of HBLI countries, and 23–65% of expected health expenditures, suggesting that these countries will be dependent on outside financing for HIV/AIDS for several decades to come.

Financial prospects for the low-burden, middle-income (LBMI) countries are very different from those for HBLIs. Many of these countries, including Brazil, Mexico, Thailand, and Ukraine, have the domestic capacity to cover most, if not all, future HIV/AIDS costs. In 2008, HIV/AIDS spending requirements in these countries were much less than 1% of GDPs and generally less than 4% of total health expenditures.

The low-burden group also includes some countries with low incomes such as Cambodia and Vietnam. For these countries, HIV/AIDS spending amounts to a small share of GDP (0·6% in Cambodia; table 2) but is a significant proportion of total health expenditure (11% in Cambodia). For these countries, external funding will be needed to support the national HIV/AIDS effort, at least in the medium term, but the prospects for domestic financial autonomy are much better than they are for HBLI countries.

In the long term, all LBMI countries we examined are projected to contain their national epidemics at a prevalence of lower than 2% in adults, and in most cases, much less than 2%. Effective and sustained prevention efforts could reduce frequency of HIV/AIDS to 0·23% in Cambodia, 0·19% in China, and 0·13% in India (table 2); the HIV/AIDS financing prospects for this group of countries are good compared with HBLIs. For Brazil, China, India, and Thailand, we project HIV/AIDS financial requirements will be less than 0·1% of GDP in 2031. If these countries were to adopt the more selective hard choices approach to prevention, they could reduce their spending even more than they could with the alternative strategies.

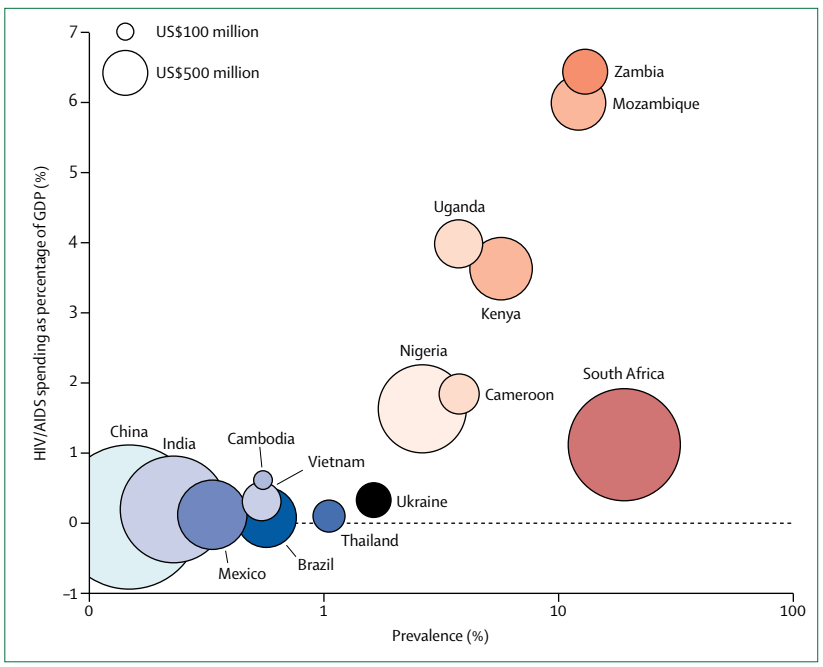

Figure: **AIDS spending requirements in 2015 for selected low-income and middle-income countries[10]**
Circle size is proportional to a country's total projected AIDS spending needs in 2015, calculated on the basis of the rapid scale-up scenario.

The distinct southern Africa cases (Botswana, Namibia, South Africa, and Swaziland) occur because they have an individual combination of continued high incidence and a robust middle-income economic status (present per-head incomes of $2250–5700[13]). For South Africa, we project a small increase (1%) in HIV prevalence between 2008 and 2015 (table 2), because although incidence decreases, more South Africans will start treatment. Required HIV/AIDS resources will nearly double in 7 years, from $1·53 billion to $2·85 billion, which is a rise of 0·3% in spending as a percentage of GDP in 2008–15 (table 2). In 2031, South Africa will spend $64 per person to combat HIV/AIDS.

Policy options for HBLI countries

Policy makers need to understand the effects of diverging scenarios for HIV/AIDS costs and financing. Despite presently receiving much external financing from the Global Fund, PEPFAR, and other bilateral donors, HBLI countries will find it difficult to meet the increased financial demands of rapidly expanding HIV/AIDS programmes over the next 5–8 years (ie, the economic crunch). For example, the number of people receiving ART in Kenya and Zambia has risen from from 1121 and 10 000, respectively, in 2003, to nearly 250 000 in each country at the end of 2008;[14] enrolments increased by 37% in Kenya and 49% in Zambia from 2007 to 2008.[2]

HBLI countries will remain dependent on external funding for decades, creating major financial risks over which they have little control. PEPFAR is increasingly discussing national ownership of its country programmes and the Global Fund has started to review and fund national strategies rather than individual grants. Despite these advances, because so much of the money for HIV/AIDS programmes in HBLI countries still comes from outside sources, much influence remains in Geneva (Switzerland) and Washington (DC, USA) and not in African and Asian capitals.[12,15] Although this might confer external leverage, the donors might find themselves locked into long-term financial support that allows little room for manoeuvre, especially where they are paying for lifetime HIV/AIDS treatments.[16]

There are several key policy options for HBLI countries. First, HBLI countries need to intensify prevention in line with the hard choices scenario and pursue the most cost-effective approaches. These approaches include increased coverage of strategies for prevention of mother-to-child transmission, male circumcision, and packages of community mobilisation, such as testing, counselling, and condom promotion for sex workers, their clients, and men who have sex with men (MSM). MSM account for a larger share of new infections in Africa than was previously thought.[17]

Second, given the large and growing demand for HIV/AIDS treatment in HBLI countries, adoption of low-cost ART approaches that maintain quality is crucial. Our aids2031 scenarios suggest that ART could take up 50–75% of future HIV/AIDS programme spending in HBLI countries. Because of spending pressures, weak domestic financing capacity, and uncertain donor support, HBLI countries need to obtain further reductions in the prices of antiretroviral drugs, laboratory tests, and diagnostic kits, and in personnel costs through task shifting.

Third, even if governments from HBLI countries adopt policies to make treatment and prevention more efficient, donors should expect to be involved in these countries for the next 20 years and possibly beyond. The Global Fund has stressed the importance of predictable long-term funding to enable governments and civil society groups to plan and carry out their programmes.[18] In recognition of this need for long-term commitment, the UK has pledged GB£640 million to the Global Fund for 5 years, stretching well beyond the current replenishment period. Although political and ethical pressures to maintain AIDS funding (especially for treatment) may limit donors' long-term financing options, the donors are still likely to adjust their exact level of funding to individual countries on the basis of the country's achievements in prevention effectiveness, treatment efficiency, and overall programme transparency.

Finally, HBLI governments could gradually increase the domestic share of spending, as a sign of the political priority they attach to HIV/AIDS and as a way to exert more control over strategic planning and decisions for financial allocation. Of the countries we analysed, the governments of Uganda and Kenya contribute less than 15% of the funds for their national HIV/AIDS efforts, and in Mozambique the domestic share is only 3%.[19–21]

Policy options for middle-income countries

For the cluster of middle-income countries in southern African with a high burden of disease, HIV/AIDS spending requirements over the next few years will probably rise faster than domestic resources alone can accommodate, even with strong political commitments to HIV/AIDS. External financing might be needed to help to fill the gap. In the long term, however, South Africa, Botswana, Namibia, and Swaziland could move toward financial self-sufficiency as their domestic economies resume growth. A detailed case study of HIV/AIDS costs and financing in South Africa, sponsored by a national steering committee and supported by aids2031, is due to be released in late 2010. The need for strong prevention measures is greatest for these countries, in which 1–2% of adults become infected every year.[4] There are reasons for cautious optimism, including speeches by the South African President Jacob Zuma[22,23] and new initiatives such as national counselling and testing campaigns and active promotion of male circumcision.

For LBMI countries, the long-term HIV/AIDS financing outlook is less constrained than it is for HBLI countries. To close their present deficits in prevention and treatment coverage, some LBMI countries will need to increase their spending in the next few years, but as a share of national economic activity and of health spending, the required resources for HIV/AIDS will remain low.

Low burden countries with low income status, such as Cambodia and Vietnam, are presently dependent on external financing for their national HIV/AIDS programmes. About 86% of Cambodia's spending of $55 million per year comes from the donors. In our scenarios, sustained rates of solid economic growth should allow Cambodia to gradually reduce dependence on external financing. The Cambodian Government is already considering such options. As part of aids2031, Cambodia is modelling long-term costs and financing of its HIV/AIDS response. At a national workshop on Nov 19, 2009,[25] Cambodian officials presented several scenarios aimed at expansion of domestic financing and cutting dependence on donor funding.

For LBMI countries such as Brazil, Thailand, and Ukraine, financing of the national HIV/AIDS response is already carried out mainly with domestic resources (100% of total HIV/AIDS spending in 2006–07 for Brazil, 83% for Thailand, and 51% for Ukraine).[26,27] In these circumstances, governments should be able to pay the full cost of fighting HIV/AIDS in the next decade. The big challenge will be political, not economic: will

	PEPFAR*			Global Fund†		
	Number of countries	Total funds, millions (US$)	Share of PEPFAR funds (%)	Number of countries	Total funds, millions (US$)	Share of Global Fund funds (%)
Low income	14	2388	62%	67	4586	73%
Lower-middle income	13	802	21%	36	1571	25%
Upper-middle income	4	660	17%	10	143	2%
Overall	31	3850	100%	113	6300	100%

Data from references 33 and 34. No high-income countries were eligible to receive grants from PEPFAR or the Global Fund. PEPFAR=President's Emergency Plan for AIDS Relief. *PEPFAR funds shown are disbursements from the programme's inception to June, 2009, plus approved financing for all successfully submitted 2009 country operational plans. †Global Fund numbers are for HIV/AIDS only, and are cumulative disbursements to mid-2010. Grants were assigned to a country group based on the recipient country's World Bank income classification at the time of grant application.

Table 3: **Distribution of PEPFAR and Global Fund grants to countries, by income group**

governments be willing to channel funds to prevention and treatment programmes that mainly cover population subgroups who are marginalised and whose behaviours are frequently condemned, such as sex workers, MSM, and injecting drug users?[28]

In this context, LBMI countries and their international partners need to consider several policy options, beginning with a strong focus on prevention for those most at risk. By doing so, these countries can save money in the short term through reduction of spending that is untargeted and has little effect on HIV transmission, and in the long term by cutting the overall cost of ART, because high rates of prevention will lead to fewer people on treatment in the future.[29] Presently, many LBMI countries cover only a small fraction of their most at-risk populations. Prevention services reach only 20% of MSM in the Philippines, 25% in Vietnam, and 40% in China and Indonesia.[30] There are some encouraging signs that LBMI governments are prepared to address the sensitive issues of stigma and discrimination directly. The decision of the Delhi high court (India) to strike down an anti-sodomy law[31] dating from British rule in the 1860s and the launch of needle exchange and methadone programmes for injecting drug users in China[32] should be emulated by other countries.

Donors should be able to reduce their support to the LBMI countries progressively during the next 5–10 years, on the basis of well defined and mutually agreed strategies for country transition and exit. Funds could then be redirected to HBLI countries. About 38% of PEPFAR funds and 27% of Global Fund grant disbursements have gone to middle-income countries (table 3).[33,34] Even if South Africa, Botswana, Namibia, and Swaziland are excluded, 18% of PEPFAR and 21% of Global Fund resources are still allocated to middle-income nations. During a transition period, donors could promote policy dialogue and assist national governments and civil society organisations to pilot and learn from targeted prevention approaches for commercial sex workers, MSM, and injecting drug users. Donors would be seen as short-term catalytic agents rather than as a long-term presence in these countries.

Conclusions

An important lesson from the aids2031 project is that everyone who is working to combat HIV/AIDS (governments, civil society, donors, and others) needs to focus on long-term trends and outcomes if we are to adopt the best policies today. Since the mid-1990s, we have often been preoccupied with the legitimate short-term challenges of achievement of large-scale political, social, and financial mobilisation and rapid expansion of HIV/AIDS treatment. This work has yielded impressive results. However, our short-term outlook has caused us to lose sight of some of the key actions we need to take now to save money in the future, such as investment in research and development to generate game-changing technologies and intensification of targeted, cost-effective prevention.

In the next few years, sustaining momentum will be difficult in the face of global economic slowdown, competing issues such as global climate change, and the increasingly divergent situations of countries with different epidemic burdens and economic capacities. Rather than deny these differences, we need to accept and embrace them to design customised responses and maintain solidarity and aims in our global efforts to end HIV/AIDS.

Conflicts of interest

We declare that we have no conflicts of interest.

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References

1 UNAIDS. What countries need: investments needed for 2010 targets. Geneva: United Nations Programme on HIV and AIDS, 2009.

2 WHO/UNICEF/UNAIDS. Towards universal access: scaling up priority HIV/AIDS interventions in the health sector. Progress report 2009. http://www.who.int/hiv/pub/tuapr_2009_en.pdf (accessed Dec 6, 2009).

3 UNAIDS/WHO. AIDS epidemic update: November 2009. http://data.unaids.org/pub/Report/2009/2009_epidemic_update_en.pdf (accessed Dec 8, 2009).

4 Hallett TB, Stover J, Mishra V, Ghys PD, Gregson S, Boerma T. Estimates of HIV incidence from household-based prevalence surveys in sub-Saharan Africa. *AIDS* 2010; **24:** 147–52.

5 WHO. Rapid advice: antiretroviral therapy for HIV infection in adults and adolescents, November 2009. http://www.who.int/hiv/pub/arv/rapid_advice_art.pdf (accessed Dec 14, 2009).

6 Hecht R, Bollinger L, Stover J, et al. Critical choices in financing: the response to the global HIV/AIDS pandemic. *Health Affairs* 2009; **28:** 1591–1605.

7 aids2031 Costs and Financing Working Group. Washington, DC: Results for Development Institute, 2009. http://www.resultsfordevelopment.org/projects/aids2031-costs-and-financing-working-group (accessed Dec 11, 2009).

8 Rao Gupta G, Parkhurst JO, Ogden JA, Aggleton P, Mahal A. Structural approaches to HIV prevention. *Lancet* 2008; **372:** 764–75.

9 Bollinger L, Stover J, Avila C. The financial implications of the 2010 WHO recommendations for ART in resource limited settings. XVIII International AIDS Conference; Vienna, Austria; July 18–23, 2010.

10 Bollinger L, Stover J, Forsythe S. Estimating long-term global resource needs for AIDS through 2031. http://www.resultsfordevelopment.org/products/estimating-long-term-global-resource-needs-aids-through-2031 (accessed Sept 8, 2010).

11 Karim QA, Karim SS, Frohlich JA, et al. Effectiveness and safety of tenofovir gel, an antiretroviral microbicide, for the prevention of HIV infection in women. *Science* 2010; published online July 19. DOI:10.1126/science.1193748.

12 PEPFAR. The US President's Emergency Plan for AIDS Relief five-year strategy, 2009. http://www.pepfar.gov/documents/organization/133035.pdf (accessed Dec 10, 2009).

13 World Bank. World Development Indicators Online. Washington: World Bank Group. http://data.worldbank.org (accessed Nov 11, 2009).

14 USAID/UNAIDS/WHO/UNICEF/POLICY Project. Coverage of selected services for HIV/AIDS prevention, care, and support in low and middle income countries in 2003. POLICY Project, June 2004. http://data.unaids.org/pub/Report/2004/2004-coveragesurvey2003report_en.pdf (accessed Sept 9, 2010).

15 The Global Fund to Fight AIDS, Tuberculosis, and Malaria. Progress report on the implementation of the Global Fund's strategy, 2009. http://www.theglobalfund.org/documents/replenishment/caceres/ProgressReport_GlobalFundStrategy.pdf (accessed Dec 10, 2009).

16 Over M. Prevention failure: the ballooning entitlement burden of U.S. global AIDS treatment spending and what to do about it, 2008. Center for Global Development Working Paper 144. http://www.cgdev.org/files/15973_file_Presidential_AIDS_Policy_FINAL.pdf (accessed Dec 21, 2009).

17 UNAIDS. HIV prevention response and modes of transmission analysis. Nairobi, Kenya: United Nations Programme on HIV and AIDS, 2009.

18 The Global Fund to Fight AIDS, Tuberculosis and Malaria. Mid-term review of the second voluntary replenishment 2008–2010: note on long-term financing commitments. http://www.theglobalfund.org/documents/replenishment/caceres/Note_LongTerm-FinancingCommitments.pdf (accessed Dec 23, 2009).

19 National AIDS Control Council. Uganda Progress Report for United Nations General Assembly Special Session on HIV/AIDS, 2008–2009. UNGASS progress report 2010. March, 2010. http://data.unaids.org/pub/Report/2010/uganda_2010_country_progress_report_en.pdf (accessed Sept 9, 2010).

20 National AIDS Control Council. Progress Report for United Nations General Assembly Special Session on HIV/AIDS Country Report-Kenya. UNGASS progress report 2010. March, 2010. http://data.unaids.org/pub/Report/2010/kenya_2010_country_progress_report_en.pdf (accessed Sept 9, 2010).

21 National AIDS Control Council. Mozambique 2008 Progress Report for United Nations General Assembly Special Session on HIV/AIDS. UNGASS progress report 2010. March, 2010. http://data.unaids.org/pub/Report/2010/mozambique_2010_country_progress_report_en.pdf (accessed Sept 9, 2010).

22 Zuma J. Address by the President of the Republic of South Africa, HE Mr Jacob Zuma, to the National Council of Provinces (NCOP). Oct 29, 2009. http://www.tac.org.za/community/files/PRES%20ZUMA%20ADDRESS%20TO%20NCOP%20291009.pdf (accessed Dec 10, 2009).

23 Zuma J. Address by President Jacob Zuma on the occasion of World AIDS Day, Pretoria Showgrounds, Dec 1, 2009. http://www.info.gov.za/speeches/2009/09120112151001.htm (accessed Dec 10, 2009).

24 Bhakeecheep S. The situation in countries on available funding for ARVs, funding projections for 2010 and 2011: Thailand. Meeting of the Forecasting Working Group, WHO/HIV and UNAIDS Secretariat; Geneva, Switzerland; Oct 5–6, 2009.

25 aids2031 Cambodia Case Study. Washington, DC: Results for Development Institute, 2010. http://www.resultsfordevelopment.org/cambodia-workshop-presentation (accessed Sept 9 2010).

26 UNAIDS. 2008 Report on the global AIDS epidemic, 2008. http://www.unaids.org/en/KnowledgeCentre/HIVData/GlobalReport/2008/2008_Global_report.asp (accessed Dec 11, 2009).

27 Izazola-Licea JA, Wiegelmann J, Arán C, Guthrie T, De Lay P, Avila-Figueroa C. Financing the response to HIV in low-income and middle-income countries. *J Acquir Immune Defic Syndr* 2009; **52** (Suppl 2)**:** S119–26.

28 aids2031 Working Group on Countries in Rapid Transition. Asian economies in rapid transition: HIV now and through 2031. http://www.aids2031.org/pdfs/asian_economies_in_rapid_transition_hiv_now_and_through_2031%5B2%5D.pdf (accessed Jan 8, 2009).

29 Stover J, Bollinger L. The costs of anti-retroviral therapy in low- and middle-income countries: present commitments and future needs, 2009. http://www.futureartcosts.org/The_Costs_of_Anti-Retroviral_Therapy.pdf (accessed Dec 11, 2009).

30 UNAIDS. Redefining AIDS in Asia: crafting an effective response. Report of the Commission on AIDS in Asia, 2008. http://data.unaids.org/pub/Report/2008/20080326_report_commission_aids_en.pdf (accessed Dec 21, 2009).

31 Delhi High Court. Naz Foundation *vs* NCT of Delhi, 2 July 2009. http://lobis.nic.in/dhc/APS/judgement/02–07–2009/APS02072009CW74552001.pdf (accessed Dec 22, 2009).

32 Lui B, Sullivan SG, Wu Z. An evaluation of needle exchange programmes in China. *AIDS* 2007; **21:** 123–28.

33 Kaiser Family Foundation. Global health facts. http://globalhealthfacts.org. (accessed Nov 29, 2009).

34 Global Fund to Fight AIDS, Tuberculosis and Malaria. Grant portfolio. http://portfolio.theglobalfund.org/ (accessed July 20, 2010).