Towards an improved investment approach for an effective response to HIV/AIDS

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Substantial changes are needed to achieve a more targeted and strategic approach to investment in the response to the HIV/AIDS epidemic that will yield long-term dividends. Until now, advocacy for resources has been done on the basis of a commodity approach that encouraged scaling up of numerous strategies in parallel, irrespective of their relative effects. We propose a strategic investment framework that is intended to support better management of national and international HIV/AIDS responses than exists with the present system. Our framework incorporates major efficiency gains through community mobilisation, synergies between programme elements, and benefits of the extension of antiretroviral therapy for prevention of HIV transmission. It proposes three categories of investment, consisting of six basic programmatic activities, interventions that create an enabling environment to achieve maximum effectiveness, and programmatic efforts in other health and development sectors related to HIV/AIDS. The yearly cost of achievement of universal access to HIV prevention, treatment, care, and support by 2015 is estimated at no less than US$22 billion. Implementation of the new investment framework would avert 12·2 million new HIV infections and 7·4 million deaths from AIDS between 2011 and 2020 compared with continuation of present approaches, and result in 29·4 million life-years gained. The framework is cost effective at $1060 per life-year gained, and the additional investment proposed would be largely offset from savings in treatment costs alone.

Published **Online**
June 3, 2011
DOI:10.1016/S0140-6736(11)60702-2

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Introduction

By 2010, extraordinary amounts of political commitment, social mobilisation, and HIV/AIDS funding had resulted in an unprecedented scale-up of HIV/AIDS prevention, treatment, care, and support, a decline in incidence of new HIV infections in several countries, more than 6·5 million people receiving antiretroviral therapy, and millions of orphans able to receive basic education, health, and social protection.[1,2] Such large-scale investments helped progress towards more tolerant and enabling social environments.[3] However, despite these impressive gains, universal access to prevention, treatment, care, and support for HIV/AIDS is not available worldwide,[4] and is unlikely to be achieved with the present pace of change and with the present approaches to investment.

Previously set global targets and associated resource needs estimates[5,6] were effective for mobilisation of unprecedented resources and driving of major progress in the HIV/AIDS response, but were based on the prevailing commodity approach that targeted scale-up of discrete interventions rather than overall results, and led in many cases to fragmentation of the response.[7,8]

The approach adopted until now has various shortcomings. First, estimates of future coverage of intervention programmes were made on the basis of a large number of ambitious—and often aspirational—targets, which were not met. Second, subsequent revisions shortened the timeframe available to meet targets, making them further out of reach with increasingly unrealistic programmatic and cost assumptions. Third, as the complexities and costs of a public health response to the HIV/AIDS epidemic and the systemic weaknesses that impeded progress became apparent, the commodity approach was not conducive for countries and donors to set priorities as shown by substantial differences in resource allocation for national HIV/AIDS responses between neighbouring countries with equivalent epidemics. Unsystematic prioritisation and investment were allowed to persist[9] as interests and stakeholders competed for a proportion of available funding for HIV/AIDS, spreading resources thinly between many objectives.[10]

New approaches are needed to achieve universal access and the specific targets included in the Joint United Nations Programme on HIV/AIDS (UNAIDS) 2011–15 strategy and the United Nations Secretary General's Report to the General Assembly in June, 2011.[4,11] A change from the commodity approach to a targeted strategic investment programme driven by the latest evidence is needed to produce substantial and lasting effects on the HIV/AIDS epidemic and make the most of investment in the response.

We propose an investment framework to support management of national and international HIV/AIDS responses, encourage transparency in programme objectives and results, and enable decision makers and financiers to galvanise support for effective action. The framework differentiates between basic programme activities that aim to directly reduce HIV transmission, morbidity, and mortality; activities that are necessary to support the effectiveness and efficiency of these programmes (critical enablers); and investments in other sectors that can have a positive effect on HIV outcomes (synergies with development sectors; figure 1). The framework promotes prioritisation of efforts on the basis of a nuanced understanding of country epidemiology and context, and assumes major efficiency gains as delivery of care evolves from facility-based to community-based structures.[12]

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The framework aims to enhance present efforts to make the most of HIV/AIDS responses, including the Global Fund to Fight AIDS, Tuberculosis and Malaria's new approach to fund countries on the basis of national strategy applications[13] rather than discrete projects.[14] Equally, the framework supports improved planning for resource allocation in the largest bilateral HIV/AIDS programme, the US President's Emergency Plan for AIDS Relief (PEPFAR), which has a new and explicit focus on increased country ownership.[15] The framework will encourage countries to make the most of their programmatic responses to the epidemic through careful targeting and selection of the most effective interventions.

In this Health Policy, we present the investment framework and apply it in a costing exercise undertaken to estimate the resources needed to implement a global HIV/AIDS response in the next decade.

Investment framework

Outline

The approach previously taken by UNAIDS estimated total resource needs on the basis of unit costs and coverage targets for all commonly undertaken prevention, treatment, care, and support activities for HIV/AIDS.[5,6] Infections and deaths averted were modelled on the basis of the estimated effect of each of these interventions. The aids 2031 project[16] subsequently used much the same model to develop various scenarios for global HIV/AIDS responses; in their most optimistic scenario all component interventions would be included at full scale and lead to the largest effect, whereas in less optimistic scenarios various components were excluded with a corresponding reduction of both costs and outcomes.

See Online for webappendix

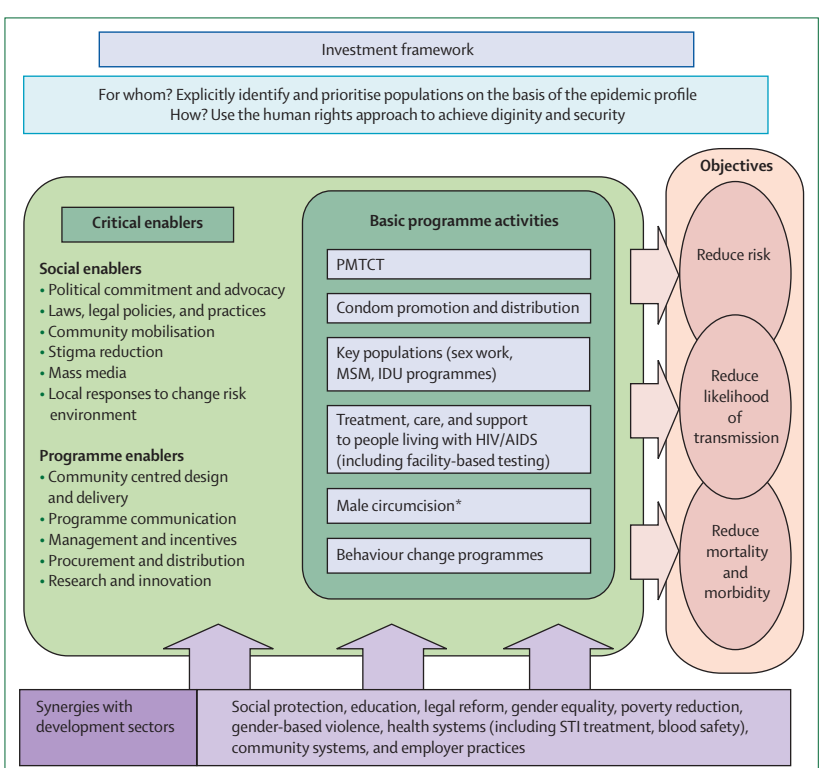

Figure 1: **Proposed framework for the new investment approach**
*Applicable in generalised epidemics with a low prevalence of male circumcision. MSM=men who have sex with men. IDU=injecting drug user. PMTCT=prevention of mother-to-child transmission. STI=sexually transmitted infection.

The investment framework that we propose departs from these approaches in five important ways. First, elements are included in the framework on the basis of a graduated assessment of the existing evidence of what works in HIV/AIDS prevention, treatment, care and support and is intended to support systematic strengthening of the evidence base when needed. Second, it applies a rigorous approach to estimation of the size of the populations in which new infections occur on a country-by-country basis and provides a basis for discontinuation of the inefficient application of programmes to the wrong populations or without regard to their outcomes. Third, the framework assumes that major efficiency gains are possible through shifting of service provision techniques to place greater emphasis on community mobilisation.[17] Fourth, the framework emphasises synergies between programme elements and makes an initial attempt to quantify these interactions (webappendix pp 28–29). Fifth, although not a prescriptive approach to programming, the framework is intended to close the conceptual gap between global resource estimation and large-scale programming to help shape investment strategies to achieve the best outcomes for fewest resources (panel 1).

Our modelling of the effectiveness of the investment framework suggests that striking numbers of new infections and deaths could be averted. For full effectiveness, all of the activities in the framework should be delivered through an approach based on human rights[20] and that is universal, equitable, and assures inclusion, participation, informed consent, and accountability (figure 1).

Basic programme activities

Basic programme activities have a direct effect on reduction of transmission, morbidity, and mortality from HIV/AIDS, and should be scaled up according to the size of the affected population. Such activities include interventions that directly affect incidence, morbidity, and mortality (such as antiretroviral therapy), and more complex interventions[21] for which there is plausible evidence[22] of their contribution to reduction of incidence through a specifiable results chain (such as behaviour change programmes). The set of activities we recommend is based on an analysis of programme effectiveness and cost-effectiveness reported in the published work supplemented by expert opinion including a consultation process and a series of meetings

www.thelancet.com **Published online June 3, 2011 DOI:10.1016/S0140-6736(11)60702-2**

with international HIV/AIDS experts.[23,24] Our recommendations build on previously published estimates of the effectiveness of HIV prevention interventions in changing sexual behaviours.[25]

Basic programme activities in the framework range in complexity and consist of procurement, distribution, and marketing of male and female condoms; activities designed to prevent mother-to-child transmission; promotion of medical male circumcision; integration of activities addressing key populations, in particular sex workers, men who have sex with men, and harm-reduction programmes for injecting drug users; behaviour change programmes that target reduction of the risk of HIV exposure through changing of people's behaviours and social norms; and antiretroviral therapy programmes.

Most scientific evidence about prevention effects comes from biomedical prevention interventions, such as the biomedical aspects of prevention of mother-to-child transmission[26] and male circumcision,[27–29] in part because these interventions are less complex, clearly defined, and easier to assess than are other interventions, especially when they are undertaken within discrete health-care settings or in randomised, controlled trials.

Behaviour change in key populations is a complex intervention but has a major effect on the trajectory of concentrated and low-scale epidemics.[30] By definition, key populations predominate in concentrated epidemics but are also present in generalised epidemics, in which they contribute an appreciable and in some cases substantial portion of the epidemic.[31,32] In addition to groups that are noted in many epidemics such as sex workers and clients, men who have sex with men, and injecting drug users, there are some populations that are important in specific contexts. For example, HIV is spread along transport routes by lorry drivers, or by fishermen on the shores of Lake Victoria in Africa.[31]

Basic activities for key populations include targeted communication and education and condom programming tailored to the population's needs; the building of social solidarity and networks of support through increasing the capacity of community organisations; and the development of peer and self-help groups. For injecting drug users, interventions include access to clean needles and syringes and to drug treatments such as opioid substitution therapy, which also reduces the prevalence of drug injection,[33] although this effect has yet to be reliably quantified.[34] Access to antiretroviral therapy in key populations must be promoted to ensure good health outcomes, promote equity, and because antiretroviral therapy access in these populations will decrease HIV incidence in the whole population.[18,35]

Behaviour change in generalised epidemics, such as a delay in the initiation of sex or partner reduction, affects the likelihood of exposure and reduction of these behaviours self-evidently reduces the likelihood of transmission. Furthermore, the importance of behaviour change has been confirmed as a plausible explanation for changes in incidence derived from ecological and modelling studies that explain previous successes in HIV prevention.[36–40] For this reason, behaviour change seems to be a discrete basic programme activity—notwithstanding the challenge of collection of consistent, direct,

Panel 1: Intervention programmes for prevention of HIV/AIDS

The effectiveness of HIV/AIDS prevention programmes depends on coverage and efficacy of their constituent interventions and the epidemiological context within which the programme operates. The context (ie, the distribution of risks of transmission and acquisition of HIV infection across the population) determines which groups should be a priority for intervention programmes and the extent to which a risk factor needs to change to reduce incidence and approach the tipping point at which infection is eliminated from those priority groups. The non-linear relation that exists between the epidemic spread of HIV/AIDS and epidemiological features means that substantial changes might be possible with a few appropriately targeted efficacious interventions. This effect can be noted through modelling of two epidemiological contexts: one in a concentrated epidemic represented by Karachi, Pakistan,[18] where transmission occurs mainly through injecting drug use, and the second in a generalised epidemic represented by KwaZulu-Natal, South Africa (data not shown), where the main route of transmission is through heterosexual sex. We compared three scenarios for these regions: first, a baseline scenario assuming present interventions continue; second, a broad and shallow target assuming moderate increases in treatment coverage and declines in multiple sexual risk behaviours (and injection risk in Karachi); and third, a narrow and deep target assuming widespread treatment and a high coverage of the most demonstrably efficacious interventions (adult male circumcision in KwaZulu-Natal and needle exchange in Karachi; table 1, figure 2). For every scenario, we assumed antiretroviral therapy would reduce transmission by 92%.[19]

Our modelling results suggest that the most targeted approach provides the greatest effect, especially in locations where the HIV/AIDS epidemic is most concentrated. However, any comparison of programmes depends on the costs of combining the different interventions within the programmes and the ability of the programmes to achieve prespecified intermediate outcomes.

	Broad and shallow	Narrow and deep
Karachi, Pakistan	50% coverage of antiretroviral therapy (CD4 cell count of <200 cells per μL); double condom use in sex work; reduction in frequency of casual sex by 15%; increase in condom use in stable partnerships by 50%; increased access to opioid substitution therapy or needle-exchange programmes by 40%; and regular pre-exposure prophylaxis use in 10% of population (assuming 40% efficacy)	80% coverage of antiretroviral therapy (CD4 cell count of <200 cells per μL); increase access to opioid substitution therapy or needle-exchange programmes by 80%
KwaZulu-Natal, South Africa	10% of uncircumcised men are circumcised; 40% coverage of antiretroviral therapy at a CD4 cell count of <200 cells per μL and 10% at a CD4 cell count of <350 cells per μL; 10% of the population counselled for risk reduction per year (leading to short-term increases in condom use); increased condom use among infected people by 15%; and regular microbicide use in 10% of women (assuming 40% efficacy)	80% coverage of antiretroviral therapy (CD4 cell count of <200 cells per μL); and 70% of uncircumcised men are circumcised

Each item is a modelled outcome indicator and the model does not specify what programmes might be required to achieve them.

Table 1: **Model assumptions for different scenarios in Karachi, Pakistan, and KwaZulu-Natal, South Africa**

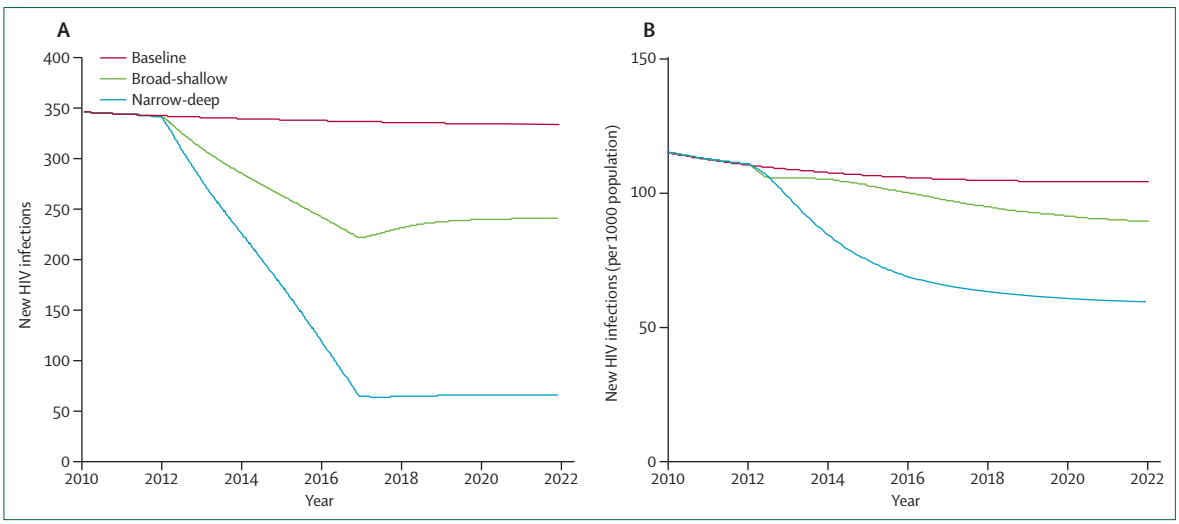

Figure 2: **Number of new infections between 2010 and 2022 projected for injecting drug users in Karachi, Pakistan (A), and the general population in KwaZulu-Natal, South Africa (B)**

The baselines assume no further interventions are implemented, the broad-shallow lines show an estimation of a wide range of interventions applied at modest scales, and the narrow-deep lines show an estimation of targeting of a small number of the most effective interventions to high scales, as described in table 1.

and generalisable data for the effect of different elements of behaviour change programmes.[41–43] The most efficacious interventions to accomplish such changes are not well established, but include programmes of interpersonal and group communication delivered through the mobilisation of civil society, faith-based organisations, and in the workplace.

Antiretroviral therapy is a key activity in the response to HIV/AIDS. Clinically, antiretroviral therapy reduces mortality and morbidity in people infected with HIV by reducing viral load and allowing the immune system to recover, and through prevention of opportunistic infections such as tuberculosis.[44–47] Antiretroviral therapy reduces the incidence of AIDS-related tuberculosis with scale of response dependent on CD4 cell count at treatment initiation. Significant reductions in incidence of tuberculosis have been achieved in settings with early initiation and high coverage of antiretroviral therapy.[48–53] In addition to the clinical benefit to individuals, lowering of viral load also has the public health benefit of prevention of onward transmission, contributing to both prevention and treatment objectives (webappendix pp 30–31).[19,54]

The antiretroviral therapy and care and support component of the framework consists of provider-initiated HIV testing or other health-facility HIV testing services (use of voluntary counselling, testing centres, or other testing approaches are counted as critical enablers in this framework) and support for treatment adherence, including family and community approaches, which can improve access to HIV/AIDS services, drug adherence, and morbidity and mortality outcomes.[55] The antiretroviral therapy component builds on the new Treatment 2.0 strategy that was designed to help reach the universal access treatment targets through development of better combination treatment regimens, less costly and simplified diagnostic techniques, and efficient, community-led approaches to delivery (panel 2).[61,62]

Critical enablers

Social stigma, poor health literacy, and a punitive legal environment hinder implementation of basic HIV/AIDS programme activities and adversely affect programme priorities by stifling the adoption of evidence-based policies and best practices. Complementary strategies to increase the effect of basic programme activities are therefore crucial to the success of HIV/AIDS programmes. These critical enablers tend to be complex interventions, and although a great deal of assessment about their effectiveness has been done, there are few experimental data in their favour. Critical enablers are also highly context specific and therefore generally poorly defined globally.

There are two categories of critical enablers: social enablers that make environments conducive for rational HIV/AIDS responses possible and programme enablers that create demand for and help improve the performance of key interventions (figure 1). Social enablers consist of outreach for HIV/AIDS testing and HIV/AIDS treatment literacy, stigma reduction, advocacy to protect human rights, and monitoring of the equity and quality of programme access and results and mass communication designed to raise awareness and support change in social norms. Programme enablers include incentives for programme participation, methods to improve retention of patients on antiretroviral therapy, capacity building for development

www.thelancet.com **Published online June 3, 2011 DOI:10.1016/S0140-6736(11)60702-2**

of community-based organisations, strategic planning, communications infrastructure, information dissemination, and efforts to improve service integration and linkages from testing to care.

Community mobilisation is essential for an effective HIV/AIDS response and underlies many of the critical enablers.[63] Programmatically, community mobilisation objectives are hard to disentangle but include several features. First, community-driven approaches in outreach and engagement activities, which successfully connect people who have similar issues and engage them in a broad spectrum of HIV-related interventions, lead to improved uptake and use of many of the basic programme activities (eg, HIV-specific education,[64] HIV/AIDS testing,[65] behavioural changes,[66] access to condoms and clean syringes,[67] and antiretroviral therapy[68,69]). Second, community mobilisation supports activities that target people who are already engaged in care and enhance quality, adherence, and effects in a range of settings such as people who are on treatment, engaged in harm reduction[70] or drug-treatment services, or who are already using sexual and reproductive health services.[71] Third, community mobilisation objectives include advocacy, transparency, and accountability efforts, such as local-scale advocacy to ensure that high-quality health services are available and accessible to susceptible populations and serve to promote and protect human rights. Although the sustained success of these approaches is not a given there are some distinctive features of HIV/AIDS financing and governance that are grounds for optimism, including the mandating of civil society representation in country governance mechanisms under the Global Fund to Fight AIDS, Tuberculosis and Malaria, the capacity for civil society shadow reporting on national progress in meeting HIV/AIDS targets set through United Nations General Assembly processes, and, globally, direct civil society representation in UNAIDS's governing body.

Synergies with other development sectors

National HIV/AIDS activities should be aligned to country development objectives and thereby support the strengthening of social, legal, and health systems to enable sound and effective responses. HIV/AIDS programmes are not implemented in isolation and should not be planned in isolation. Increasingly, chronic care of patients with HIV/AIDS has much the same challenges as have other diseases. Key development areas in which synergies with HIV/AIDS-specific efforts exist include those efforts addressing HIV/AIDS as one of many health issues, sex equality, education and justice sectors, social protection and welfare, and community systems. HIV/AIDS funding in these areas can be used as a catalyst to achieve synergies within the broader health and development programme and to promote intelligent investment across several sectors.

***Panel 2:* Cost reductions as experience of HIV/AIDS programmes and scale-up increases**

Unit costs for some services will decline as HIV/AIDS programmes expand, due to economies of scale and adaptation to efficient service provisions, especially through community-based approaches. Although there are few data for changes in unit costs with time, substantial economies of scale probably exist.[56,57] For example, per-person costs of antiretroviral therapy in the large-scale US President's Emergency Plan for AIDS Relief (PEPFAR) programmes reduced as implementation experience increased.[58] Costs reduced by 47% from 2004 to 2006 in South Africa , and by 45% from 2003 to 2006 in Zambia. In five countries (Botswana, Ethiopia, Nigeria, Uganda, and Vietnam), median per-patient costs at 24–29 months after programme initiation were reduced by 37% from rates noted in the first 5 months.[58,59] Equally, large-scale antiretroviral therapy programmes implemented by Médecins Sans Frontières in Malawi have been delivered at US$237 per patient-year, with antiretroviral drugs forming two-thirds of the total cost. This price is much lower than that reported for countries with fewer people receiving antiretroviral drugs and is also lower than were costs in Malawi when fewer people were receiving antiretroviral drugs.[60] On the basis of previous trends and the possibility of new, cheaper drug combinations, the average cost per patient of antiretroviral therapy is assumed to decline by about 65% between 2011 and 2020, with a large proportion of the cost savings after 2015 coming from an increasing shift to primary care and community-based approaches and cheaper point-of-care diagnostics.

Resources needed for the new investment framework

Our modelling exercise estimates resource needs and returns on investment for 139 low-income and middle-income countries. The resource needs estimate is the cost of increasing from present rates of coverage in 2011 to achieve universal access by 2015 and maintain it thereafter. For the baseline scenario, we assumed constant coverage at about present funding rates[72] and approaches except for the reductions in antiretroviral drug costs which we assumed would decline over time at the same rate in the baseline and the investment framework scenarios. Each of the basic programme activities in the framework was applied to relevant populations according to their demographic and epidemiological situation. These assumptions, together with definitions of the various activities included in the investment framework and assumptions about their effects and unit costs, are provided in the webappendix.

Investments in HIV/AIDS and returns

Table 2 and figure 3 show the financing needed for the full rollout of this new investment framework for 2011–20. Resource needs increase from present rates of about US$16 billion to peak at $22 billion in 2015 when universal coverage will be achieved. Resource needs will then decline after 2015 for three main reasons: first, coverage will have reached target rates for the interventions included in the new framework and will be kept stable at these rates; second, efficiency gains will continue to be achieved, in particular through cost savings in treatment commodities, simplification of laboratory monitoring, and a shift to community-based approaches in treatment and testing; and third, the

	2011	2015	2020
Basic programmes (total)	$7·0	$12·9	$10·6
Prevention of mother-to-child transmission	$0·9	$1·5	$1·3
Condom promotion	$0·4	$0·5	$0·6
Sex work	$0·2	$0·2	$0·2
Men who have sex with men	$0·3	$0·7	$0·7
Injecting drug users	$0·5	$2·3	$1·5
Treatment, care, and support (including provision of provider-initiated counselling and testing)	$4·5	$6·7	$5·5
Male circumcision	$0·1	$0·2	$0·1
Behaviour change programmes	$0·2	$0·7	$0·7
Critical enablers	$5·9	$3·4	$3·7
Synergies with development sectors	$3·6	$5·8	$5·4
Total	$16·6	$22·0	$19·8

Table 2: **Resources required for the investment framework over time (billions of US$)**

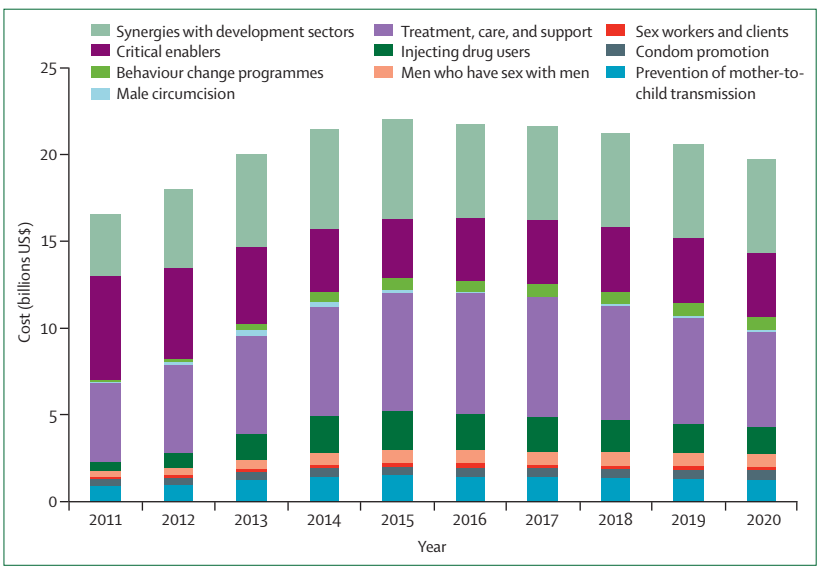

Figure 3: **Estimated cost of the investment framework, 2011–20**

decrease in new infections will start to result in decreased need for services for people who live with HIV/AIDS (table 2, figure 3).

The investment framework should lead to substantial returns on investments. Figure 4 shows the estimated number of new HIV infections and figure 5 shows the estimated number of AIDS deaths expected every year compared with funding at constant coverage at around present funding rates and approaches. The number of new infections per year drops from about 2·4 million in 2011 to 1·0 million by 2015 and continues to decline, reaching an estimated 870 000 by 2020. Compared with present trends, implementation of the new investment framework would avert an additional 12·2 million new infections between 2011 and 2020 (table 3) of which about 1·9 million are in children. The estimated reduced number of new infections and the increase in treatment coverage would avert a cumulative 7·4 million deaths from AIDS from 2011 to 2020 and result in 29·4 million additional life-years gained.

Returns on investment can be noted in terms of the difference between the investment costs and the savings incurred from avoidance of treatment costs associated with averted infections. The total incremental investment in the proposed framework is $46·5 billion from 2011 to 2020 (discounted at 3%). This investment is largely offset by the savings incurred from avoidance of treatment costs alone associated with infections averted in the same period. The present value of avoidance of treatment cost is estimated at a conservative discounted cost of $40 billion. Additionally, substantial economic gains will result as people stay healthy and productive. The investment proposed in this framework is highly cost-effective[73] with cost per life-year gained of $1060, which is less than the per-head gross domestic product of even the world's poorest region.

In our model, resource requirements for the basic programme activities increase from about $7·0 billion in 2011 to $12·9 billion by 2015 and then decrease to $10·6 billion by 2020 (table 2). Treatment is the largest basic programme activity cost category accounting for 38% of the increase in resources from 2011 to 2015. By 2015, 13·1 million of the 18·3 million people who have HIV and are eligible for treatment according to the latest WHO guidelines will be on treatment. With improved treatment techniques in the next 10 years, we assume that coverage can be increased to reach 18·7 million (86%) of the 21·9 million eligible under the present WHO guidelines by 2020. Costs also increase because of a twofold increase in coverage of outreach and needle and syringe programmes and a tenfold increase in drug substitution for injecting drug users, to reach internationally agreed coverage targets from the low present coverage.[3,34,74] Another 10% of the resource needs in 2011–15 will be taken up by increasing coverage of prevention of mother-to-child transmission services to 90% for all childbearing women living with HIV to reach elimination of new child infections by 2015.

In our model, the financing needed every year for critical enablers changes from $5·9 billion in 2011 to $3·4 billion by 2015 and $3·7 billion by 2020. The key community mobilisation component of the critical enablers increases from $0·3 billion annually in 2011 to $0·6 billion in 2015 and about $1·0 billion by 2020. The decrease in the overall category occurs mostly in non-health-facility HIV testing costs as the emphasis shifts from comparatively expensive facility-based voluntary counselling and testing centres to less expensive and more focused community-based programmes. In generalised epidemics, the overall number of tests undertaken would increase, whereas testing in concentrated epidemics would be more efficient by targeting of populations that are most at risk. Health

www.thelancet.com Published online June 3, 2011 DOI:10.1016/S0140-6736(11)60702-2

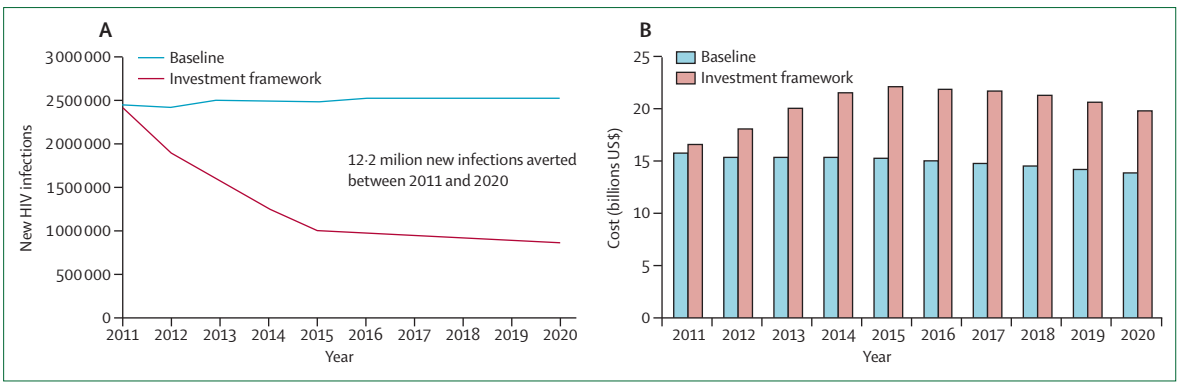

Figure 4: **Number of new HIV infections per year (A) and cost in low-income and middle-income countries (B) between 2011 and 2020 expected under the new investment approach compared with a baseline scenario assuming constant coverage at around present funding rates and approaches**

facility and provider initiated testing is included in the antiretroviral therapy component. Globally, 316 million people will receive an HIV test in 2015 in health settings, voluntary counselling and testing centres, or community settings.

Development synergies

Our estimate of financing needs to achieve strong synergies with development sectors was based on costs of gender-based violence programmes, a number of health-sector elements, youth in schools programmes, workplace education, and provision for children orphaned by HIV/AIDS (see webappendix pp 24–25). The total cost was $3·6 billion for 2011, increasing to about $5·4 billion by 2020 (table 2). While this framework does not intend to be prescriptive about spending to support sectoral synergies, this estimate is consistent with present funding approaches to systems strengthening, for example by the Global Fund. Although contributions from HIV/AIDS funding to these much larger development agendas are crucial and can be catalytic, they are a small proportion of the spending needs in these sectors ($40 billion for gender-based violence programmes,[75] $291 billion for education,[76] $390 billion for health,[77] and $236 billion for social protection in low-income and middle-income countries).

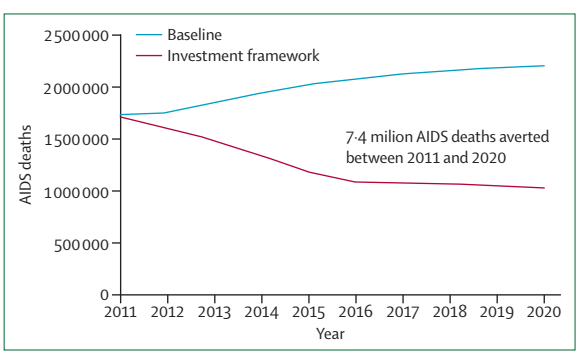

Figure 5: **Deaths from HIV/AIDS per year between 2011 and 2020 expected under the new investment approach compared with the baseline scenario assuming constant coverage at around present funding rates and approaches**

	2011–15	2011–20
Total infections averted	4 200 000	12 200 000 (US$2450 each)
Infant and child infections averted	680 000	1 900 000 ($2180 each)
Life-years gained	3 700 000	29 400 000 ($1060 each)
Deaths averted	1 960 000	7 400 000 ($4090 each)

Table 3: **Return on investment in the proposed framework**

Discussion

The United Nations high-level meeting on HIV/AIDS in June, 2011, provides an unrivalled opportunity to take stock of the striking progress made in the response to HIV/AIDS since the United Nations General Assembly Special Session on HIV/AIDS 10 years ago.[78] The meeting will allow gaps in the response to be identified and generate high-level political commitment for a substantial shift in the HIV/AIDS response to ensure programme improvement. We propose a new investment framework to guide national and international HIV/AIDS responses that promotes more strategic use of scarce resources by targeting of a core set of effective interventions and promotion of prioritisation of HIV/AIDS prevention, treatment, care, and support efforts based on country epidemiology and context. Our framework makes a distinction between basic programme activities whose effect can be predicted on the basis of coverage and adherence variables, critical enablers that are less amenable to generic description and whose effects are very context dependent, and investments in other development sectors engaged in building the systems necessary to an effective response to a global epidemic.

Major efficiencies can be achieved in the HIV/AIDS response through improved integration and increased support for community mobilisation as a key modality for the achievement of prevention and treatment goals, protection and realisation of human rights, outreach to hidden and marginalised populations, stigma reduction,

increased treatment adherence, and reduced loss to follow-up.

The framework also proposes a more considered approach to establish what a fair share is for HIV/AIDS funding to support systems strengthening and the wider social and public benefits that are more distally associated with HIV/AIDS. The framework regards HIV/AIDS resources in the context of the totality of funding needs across these sectors, and proposes that in the future, a much closer identification of opportunities for HIV/AIDS responses is made to catalyse wider sectoral responses—for example, attention to gender-based violence as it occurs in the context of humanitarian emergencies, or in specific labour migration settings. Taking HIV/AIDS into account in the implementation of development programmes has much promise in enabling of relatively modest investments to leverage effects on HIV/AIDS in the context of the Millennium Development Goals.[79,80] Furthermore, this approach will help to ensure that HIV/AIDS programmes are not seen as isolated and pursued as vertical programmes without reference to other health and development needs.

Although our framework stresses a defined set of evidence-based interventions in basic programme activities, critical enablers, and achievement of development synergies, it does not explore optimal delivery models for scaling up of these bundles of interventions since the models will vary dependent on context. The rapid expansion in the number of people receiving antiretroviral therapy means health systems must continue to provide preventive interventions and acute life-saving care for those with advanced AIDS while also providing long-term services to growing cohorts of more stable patients receiving antiretroviral therapy who will develop non-communicable diseases and comorbidities as a result of longevity, long-term effects of HIV, and effects of protracted antiretroviral therapy.[81] Because the service delivery costs account for almost two-thirds of the total cost of antiretroviral therapy,[82] a renewed emphasis on the best ways to deliver bundled interventions and achieve synergies with related health services through effective integration must be a priority for policy makers, financiers, and implementers alike.

Translation of the framework into fixed implementation guidance at country level will need a nuanced understanding of country context, epidemiological features, and the partnerships necessary for an effective HIV/AIDS response. Our framework recognises that the coverage of basic programme activities and the combination and level of critical enablers and synergies with other development sectors must be determined at national and subnational level in which decision makers are sensitive to context and the respective barriers to scaling-up of evidence-informed responses. Because many of the critical enablers are local, decentralisation of decision making and funding will be necessary. This decentralisation would be a marked departure from present practice, in which little HIV/AIDS funding reaches indigenous local organisations (Rodriquez-Garcia R, personal communication). The increased emphasis of international financiers such as the Global Fund and PEPFAR on financing of well-conceived national strategies on the basis of informed demand, which takes into account local epidemiological features and evidence-based interventions to address local challenges, will enable more explicit and fairer prioritisation of interventions targeted at key at-risk groups than is possible at present.

The modelling approach that we undertook to estimate the resources needed to implement a global HIV/AIDS response with a new investment framework has several limitations. We estimated the scale of the basic programme activities from available demographic and epidemiological data although estimates of the size of relevant populations are imperfect.[3,30] Subsequent iterations of these estimates will be shared with countries and contribute to an ongoing cycle of data collection, needs estimation, and resource mobilisation, which will direct a more effective response. Another limitation of the model we used is that the quantification of critical enablers and the synergies with other development sectors was complex and empirical data were scarce, but estimates were made with the most plausible available data.

As with any modelling exercise, we made a number of assumptions about the future. One of the important drivers of the changes in cost estimates in time was our assumption of technical efficiency gains in the delivery of treatment—although these efficiency gains are consistent with existing implementation experience.[12] We also made assumptions about the capacity of communities to have an increased role in the HIV/AIDS response, including community-based approaches to service delivery. Our assumptions take into account the need for remuneration of community and lay workers and the importance of training, guidance, supervision, and participation of people living with HIV that is emphasised in the extensive published work on community-based approaches in other health sectors[83] and task shifting to communities in the context of HIV/AIDS.[84–87] We also assumed that policy environments will allow human rights violations and laws and practices that impede the HIV/AIDS response to be addressed.

A limitation of our analysis is that we did not account for the costs of either the investment in present and future research and development of new HIV/AIDS technologies and approaches, and did not estimate the potential future benefits of these investments. However, substantial advances will probably be made in development of an HIV vaccine, microbicides, and other new modes of antiretroviral therapy-mediated HIV prevention, and in novel strategies as yet unknown. Indeed, these novel strategies will be needed to increase the momentum in radically reducing new HIV infections

 Published online June 3, 2011 DOI:10.1016/S0140-6736(11)60702-2

after 2015 (see webappendix pp 32–33). In the absence of the ready availability of new products or approaches and agreed global guidance for their use, such interventions have not been included as specific programme components and costed in this report.

Nevertheless, a strength of our proposed framework is that it does allow adaptation as new evidence emerges, especially if new technologies or approaches show that they directly affect incidence, morbidity, and mortality from HIV/AIDS and can be consistently scaled up with the criteria used for basic programme activities. The most recently published results of the HPTN 052 study[88] show that antiretroviral therapy is highly effective for prevention of transmission of HIV in discordant couples between whom the index case has CD4 cell counts of 350–550 cells per μL. WHO will release guidelines on HIV testing and counselling for couples in July, 2011. The guidelines will consider the evidence from the HPTN 052 trial.[88] An initial analysis of available data shows that increasing the treatment target for 2015 by 1 million would allow the provision of treatment for prevention for people living with HIV with CD4 cell counts of above 350 cells per μL, including coverage for all those in discordant couples. This investment would need additional resources in the order of $500 million in 2015 and would result in averting around an additional 340 000 infections between 2011 and 2020.

The limitations of our study are balanced by the rigour of the investment framework, which is timely and crucial in the present resource-constrained environment as it will help spur international financing agencies such as the Global Fund and PEPFAR to develop guidance to countries that benefit from international financing to invest resources with greater strategic focus and allow the countries to develop high quality and well informed demand for financing.

The proposed framework has been assessed against present funding scales and effects. Its implementation would be a striking departure from business as usual for governments, financiers, implementers, normative agencies, and providers of technical support. If all partners commit to a radically more effective approach to HIV/AIDS spending than exists at present, then notable gains in infections averted and life years gained will be achieved from a funding increase of a third in the short term and a funding rate of an extra 20% per year in the medium term. These investments would also be remarkably cost effective and more than offset by the substantial economic and social gains that could be achieved. Through its encouragement of more targeted investment and better priority setting, the framework proposes an important advance in achieving value for money in the HIV/AIDS response, which is crucial given the constraints on available resources. More important, the framework shows that the prospect of overcoming the HIV/AIDS epidemic and decisively breaking its trajectory is realistically achievable.

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Contributors
BS had responsibility for the overall design, management of the process, analysis and writing of this Health Policy. CA, PDG, EG, MO, and AES contributed to the data analysis, interpretation, and writing. LB, GG, TH, and JS contributed to modelling, analysis, and writing. RAt, DB, MB, MdF, GH, CH, ML, KL, CM, NP, YP, and RAl contributed to the conceptualisation, analysis, and writing.

Conflicts of interest
DB received consultation fees payment from Pangea Global AIDS Foundation and unrelated honoraria from UNAIDS, International Civil Society Support Project and Merck Foundation. GG received grant from the Wellcome Trust and was paid consultancy fees by GlaxoSmithKline, Merck and Sanofi Pasteur MSD for HPV vaccination works. TH received grant from Wellcome Trust for Fellowship and received grants and consultation fees from the Bill & Melinda Gates Foundation. NP received consultation fees from the Bill & Melinda Gates Foundation. The findings and conclusions in this paper are those of the authors and do not necessarily represent the views of the US Department of State.

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