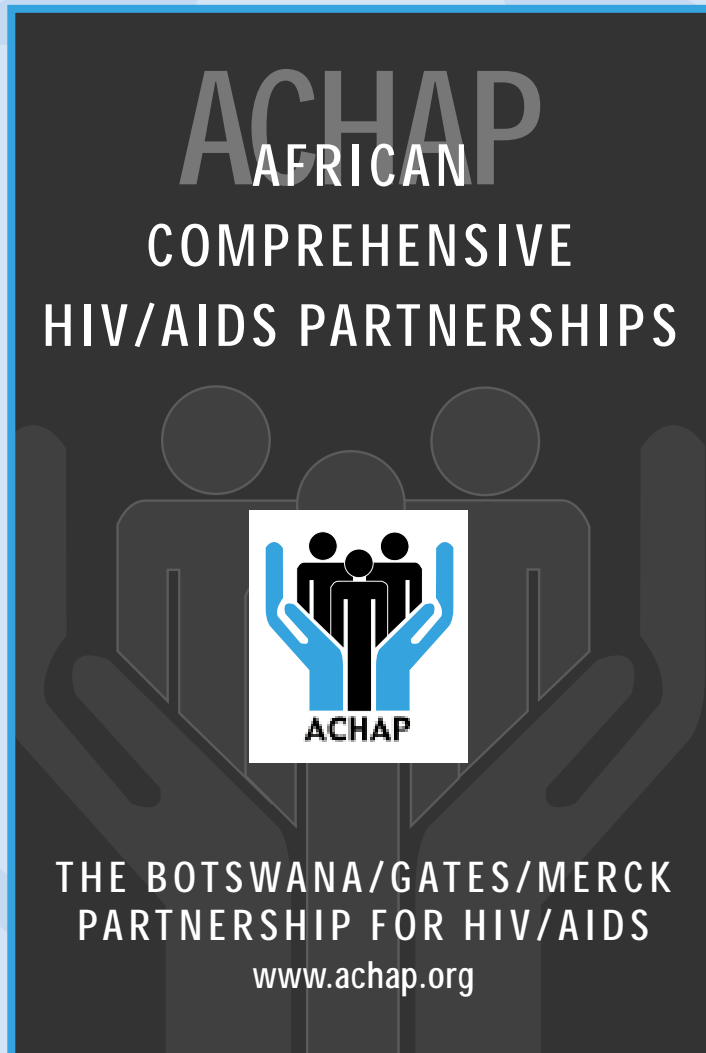


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ACHAP

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The African Comprehensive HIV/AIDS Partnerships (ACHAP) is a collaboration between the Government of Botswana, the Bill & Melinda Gates Foundation, and The Merck Company Foundation/Merck & Co., Inc., to prevent and treat HIV/AIDS in Botswana. ACHAP, established in July 2000, supports the goals of the Government of Botswana to decrease HIV incidence and significantly increase the rate of diagnosis and the treatment of the disease, by rapidly advancing prevention programmes, healthcare access, patient management and treatment of HIV/AIDS. The Bill & Melinda Gates Foundation and The Merck Company Foundation have each dedicated US\$50 million over five years towards the project. Merck & Co., Inc., is also donating its two antiretroviral medicines for appropriate treatment programmes developed by the Government of Botswana for the duration of the initiative. (www.achap.org)

BOTSWANA

Strategies for a National AIDS Treatment Programme in Botswana

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ABSTRACT

BACKGROUND

The prevalence of HIV in Botswana has reached epidemic proportions. In response to this, the African Comprehensive HIV/AIDS Partnerships (ACHAP)** formed a public-private team comprising staff from ACHAP and the National AIDS Coordinating Agency (NACA), consultants from McKinsey & Company, and a number of Ministry of Health officials to recommend strategies for the implementation of a National AIDS Treatment Programme in Botswana.

METHODS

A combination of public health, business, and medical approaches was used to evaluate the potential demand for highly-active antiretroviral therapy (HAART). HIV referral centres were in Gaborone, Francistown, Maun, and Serowe. Subjects were HIV-positive target groups: pregnant

women and qualifying partners, paediatric inpatients, adult inpatients, and patients with tuberculosis. The main outcome measure was the ability of the current healthcare system to meet the demand, and the strategies and resources required for implementation of the proposed programme.

RESULTS

A total of 110,000 HIV-positive individuals fulfilled the total latent demand for HAART. Despite adequate financial resources and availability of drugs, there were substantial barriers that would impede the programme's implementation. Particular limiting factors were well-trained human resources and physical infrastructure. The programme should, therefore, adopt a phased roll-out approach targeting selected patient groups in key strategic catchment areas. Strategic

recommendations include the launch of an Information, Education, and Communication Programme, the development of consensus goals between participating organisations, effective project management, implementation of an information technology infrastructure, and the management of risk. The team estimated that the total cost for implementation of these recommendations over the first year would be approximately US\$28 million.

CONCLUSIONS

The National AIDS Treatment Programme can be realistically and practically implemented using a phased roll-out approach and the key strategies recommended herein, targeting select patient groups in key catchment areas.

**a partnership between the Government of Botswana, the Bill & Melinda Gates Foundation, and The Merck Company Foundation/Merck & Co., Inc.

BACKGROUND

Before the full emergence of the acquired immunodeficiency syndrome (AIDS) epidemic, Botswana was considered a remarkable economic success story. Despite its relatively small population of 1.6 million people, the country stood as a leading economy in Africa. Driven by a strong diamond industry and service sector, Botswana continues to have the highest gross domestic product (GDP) per capita of any African nation at US\$3348 (2001 value). However, income disparity is quite high, with 60% of the population earning less than US\$2 per day.¹ The Government of Botswana has initiated a number of impressive developments within health and education. Seventy-five per cent of the population now has access to basic health services, 97% of children are enrolled in primary schools and 76% of adults are literate.² In addition, the entire country has access to health services free of charge via the public healthcare system. A summary of population, economic, and healthcare demographics for Botswana is presented in Table 1.³

Since the upsurge of human immunodeficiency virus (HIV) infection in Botswana, the country has been in the unfortunate situation of having one of the highest prevalences of HIV in the world. An estimated 38.5% of those aged 15–49 years are HIV-positive and it is estimated that one in every eight children is born with HIV.⁴ Not surprisingly, this has led to a fall in a number of human development indicators in Botswana. Average life expectancy has dropped from a

TABLE 1. Basic population, economic and healthcare demographics for Botswana.

Population	
Total (millions) ¹	1.6
Male (%) ²	48
Total aged < 18 years (%) ¹	50
Total living in rural areas (%) ³	48
Infant mortality rate (%) ¹	7.4
Economic	
GDP (US\$ per cap) ¹	3300
Adults in formal employment (%)	32
GDP from mining copper and diamonds (%) ²	38
Healthcare	
Doctors (n/1000 population) ³	0.32
Access to basic healthcare (%) ²	75
Referral hospitals (n)	3
District hospitals	8
Primary hospitals	16
Clinics	209
Health posts	343
Mobile stops ³	725

projected 70 years to 39 years, and a boy aged 15 years today has almost a 90% risk of dying from AIDS. The country currently faces major crises with respect to a rising population of orphans with AIDS, with attendant high costs of home-based care and a rapidly disappearing workforce.^{5–7}

The HIV epidemic causes a heavy burden for the healthcare system, with most hospitals operating at more than 100% of capacity. Outpatient facilities and home-based care units provide palliative care and prophylaxis as well as the management of opportunistic infections and other HIV-related clinical manifestations.

Under the leadership of President Festus Mogae, the Government of Botswana has communicated that it is fully committed to responding to the epidemic. However, there are a number of key strategic gaps that have led to fragmented national initiatives. Key areas for improvement are human resource planning and institutional guidance to support the implementation and the rapid scale-up of highly active antiretroviral therapy (HAART) to complete the continuum of care. The introduction of support groups for people living with HIV and AIDS, and the initiation of a comprehensive national prevention campaign

(including behavioural change, reduction of the stigma of being HIV-positive, and the promotion of open discussion) may aid these initiatives.

In July 2000, the Government of Botswana entered into a public-private partnership with the Bill & Melinda Gates Foundation, and The Merck Company Foundation/Merck & Co., Inc., to form the African Comprehensive HIV/AIDS Partnerships (ACHAP). The mission of ACHAP is to support the development and implementation of a comprehensive response to the HIV epidemic.

The first assignment of ACHAP was to support the Government of Botswana in exploring the feasibility of offering HAART through the public health system.⁸ This approach is intended to complete the continuum of care and complement ongoing prevention efforts as part of a comprehensive multi-sectoral HIV/AIDS strategy aimed at achieving the goal of a zero level of new HIV infections by the year 2016. To initiate this strategy, in May 2001 a multidisciplinary team comprising ACHAP, the National AIDS Coordinating Agency (NACA), consultants from McKinsey & Company, and

Ministry of Health officials were given the task of assessing: 1) the demand for HAART; 2) the capacity to build up requirements for the implementation of a National AIDS Treatment Programme; and 3) organisation and project management issues. This report provides a systematic assessment of the processes, capacity, resources, and infrastructure that were identified as necessary to implement a National AIDS Treatment Programme in Botswana and which subsequently formed the basis for the development of the current HAART programme.

METHODS

DATA COLLECTION

Several methods of data collection were employed over a period of 8 weeks, including interviews with local and international community leaders, medical personnel and medical aid organisations; literature reviews; site and clinic inspections; review of clinic and hospital records; and consultations with key local stakeholders. Investigations focused on three key areas: assessment of the demand for HAART, determination of the resources required, and preparation for the implementation of a National AIDS Treatment Programme.

ASSESSMENT OF THE DEMAND FOR HAART

The total latent demand for HAART was assessed in terms of the total number of people who would

potentially require HAART if a set of predefined eligibility criteria was imposed. Clinical eligibility for HAART is still a matter of controversy with differing criteria offered by various groups.⁹ Literature searches^{10,11} together with interviews with local and international HIV/AIDS experts resulted in the following criteria: HIV-positive adults with a CD4 cell count $\leq 200 \text{ mm}^3$ and/or the presence of an AIDS-defining illness (including tuberculosis), and all HIV-positive children aged between 6 months and 15 years with a CD4+ cell count suggestive of severe immunosuppression.

Estimates for the total latent demand for HAART in Botswana were based on United Nations (UN) AIDS prevalence data, which showed that in 2001 there were approximately 290,000

HIV-positive individuals in Botswana (130,000 males; 150,000 females; 10,000 children).¹² According to the US Centers for Disease Control and Prevention, ~20–30% of HIV-positive individuals have a CD4+ cell count $< 200 \text{ mm}^3$.¹³ In addition, it has been estimated that ~5–10% of all individuals with a CD4+ cell count $> 200 \text{ mm}^3$ are symptomatic with an AIDS-defining illness.¹⁴ Finally, a recent Rwandan study found that ~70% of HIV-positive children were aged > 6 months.¹⁵

TARGET GROUPS AND CENTRES

Addressing the total latent demand for HAART in the first year would place a high burden on the Botswana healthcare system. Two options were considered to address this issue: 1) to adopt a “first-come, first-served” approach, on the understanding that

only ~10% of the population of Botswana are aware of their HIV status, therefore making it unlikely that the total latent population (defined as HIV-positive people with a CD4+ cell count of $< 200 \text{ mm}^3$ and/or symptomatic disease, and unaware of their HIV-status) would present for treatment when HAART first became available (Tom Kenyon, US Centers for Disease Control, personal communication, 2001); and 2) to adopt a targeted approach in order to manage demand, based on selected populations and key strategic catchment areas. The team decided to adopt the latter approach and identified four HIV-positive target groups in four strategically located referral centres (based in Gaborone, Francistown, Maun, and Serowe) for evaluation of the immediate demand for HAART within the first year. The target groups identified were: pregnant women and qualifying partners with a CD4+ cell count $< 200 \text{ mm}^3$ (approximately

12% of pregnant women attending antenatal clinics are in a stable relationship); paediatric inpatients aged > 6 months; adult inpatients with an AIDS defining illness; and patients with tuberculosis. Estimates of patient numbers were made from interviews with local practitioners and observed referral patterns from the aforementioned catchment areas.

DETERMINATION OF REQUIRED RESOURCES

Determination of the resources required to provide HAART to the total latent population and to the immediate target population over the first year was then estimated. A “bottom-up” assessment by site and patient type was used with an operational patient-flow model developed by the team in collaboration with local healthcare practitioners, thus reflecting the local standard of care and work patterns (see Figure 2 in Results section). Information gleaned

from interviews with physicians, health officials, and international experts was included, as were data from published reports. The model included initial testing for HIV status, subsequent testing for CD4+ cell count, initiation of HAART, follow-up to determine patient adherence to therapy and adverse events, and longer-term monitoring of treatment success or failure.

Six types of resources were analysed in detail: 1) human resource availability including the need for discrete and ongoing training; 2) drug distribution and storage capacity; 3) testing capacity; 4) counselling infrastructure; 5) physical space; and 6) information technology (IT).

On the basis of the results of these analyses, the team planned to recommend key actions that could help ensure high-quality implementation of the programme.

RESULTS

ESTIMATED DEMAND FOR HAART

Applying the estimates obtained from the UN and the US Centers for Disease Control to the Botswana population, 110,000 HIV-positive individuals fulfilled the eligibility criteria for the total latent demand for HAART in 2001. Of these, 19,600 adults (9100 males, 10,500 females) were estimated to be symptomatic with an AIDS-defining illness (despite having a CD4+

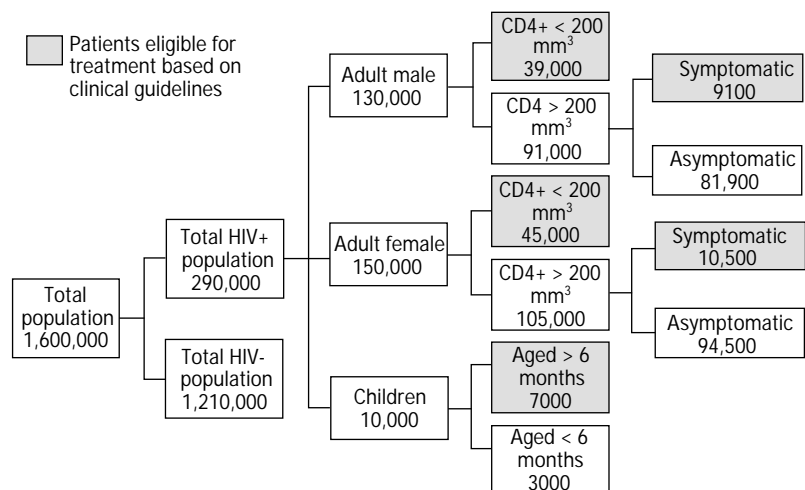
cell count $> 200 \text{ mm}^3$), 84,000 adults (39,000 males; 45,000 females) were estimated to have a CD4+ cell count $< 200 \text{ mm}^3$, and 7000 children aged 6 months to 15 years were estimated to be HIV-positive (Fig. 1).

The immediate demand for HAART over the first year for the four priority patient groups located in the four strategically defined catchment areas was estimated at 19,210 HIV-positive patients (approximately 18% of

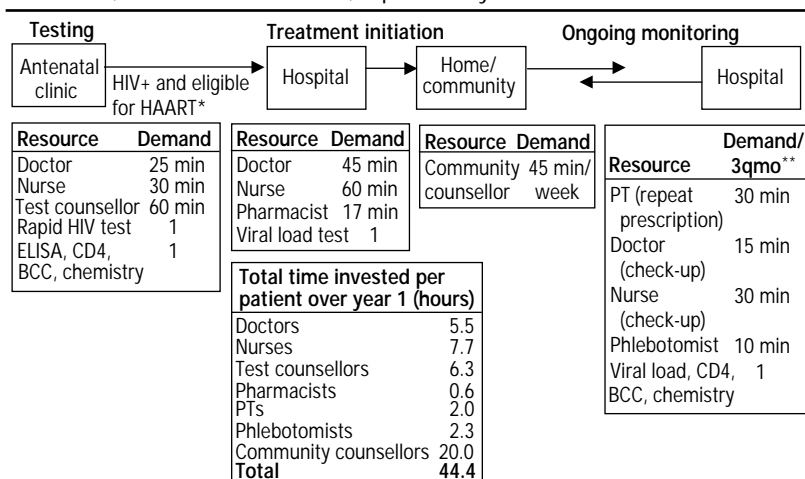
national demand), comprising 4155 pregnant women and their partners, 5255 patients with tuberculosis, 820 paediatric inpatients, and 8980 adult inpatients (Table 2).

RESOURCE REQUIREMENTS

To address the immediate demand of the target HIV-positive population, Botswana requires a supply infrastructure to treat approximately 19,000 patients in year one, with the capacity to increase the number of

FIGURE 1. HIV status of the Botswana population**TABLE 2.** Estimated immediate demand from four priority groups in four target catchment areas during the first year

Patient group	Gaborone	Francistown	Maun	Serowe	Total
Pregnant women and partners	1605	960	710	880	4155
Tuberculosis patients	2030	1210	900	1115	5255
Paediatric inpatient	315	190	140	175	820
Adult inpatient	2600	3650	1725	1005	8980
Total	6550	6010	3475	3175	19,210

FIGURE 2. Operational patient flow model estimating the total resource requirements for a HIV-positive pregnant woman over 1 year. PT=pharmacy technician; BCC=blood cell count; 3qmo=every 3 months

* Patients who are HIV-positive but not eligible for HAART are monitored at 6-monthly intervals and are included in estimates for resource requirements.

** Demands listed are for standard treatment. Some patients are expected to develop drug-related toxicities or resistance and will require additional resources.

patients treated by 20,000–25,000 per year for the following 6–8 years.

Figure 2 shows the operational patient-flow model for implementation of the programme over one year. The operational patient-flow model provides an estimated breakdown of the time required for each of the individual elements of care from confirmation of HIV status through to initiation of HAART and subsequent patient monitoring. The example presented is based on an HIV-positive pregnant woman (receiving antenatal care) and demonstrates that approximately 44.4 resource hours are required per patient per year for implementation of the programme to this target group. The model can be modified to represent the resources required for any of the other HIV-positive populations in Botswana.

HUMAN RESOURCES

Using the operational patient-flow model and the estimated time spent with different healthcare providers for clinical and diagnostic interventions, the overall projected resource requirements to meet the total latent demand of 110,000 patients are considered to be inadequate. To meet this demand, the public health system of Botswana needs to expand capacity by approximately 30% for doctors, 8% for nurses, 130% for pharmacists, and 62% for pharmacy technicians. Resources for provision of laboratory testing need to increase by over 2000% for CD4 and viral load testing (the latter is currently not available in Botswana) (Table 3).

To address the immediate demand of the four target groups over the first year, approximately 62% of the total

TABLE 3. Available and projected need of key healthcare resources for addressing the latent demand for implementation of HAART. All figures are based on an estimated latent demand of 110,000 patients requiring immediate treatment with HAART

Key resource	Current national capacity (n)	Required increase (n)	Required Increase (%)
Human resources (full time employees)			
Doctors	514	143	30
Nurses	4416	354	8
Pharmacists	29	38	130
Pharmacy technicians	164	102	62
Testing infrastructure (number required/day)			
ELISA tests	1464	300	20
CD4 testing	100	2499	2500
Viral load testing	—	2618	2600

TABLE 4. Key resource requirements available to address the immediate demand during the first year

Key resource	Vacancies recruitment requirements	Potential with available budget*	Resource available (%)
Doctors	50	34	68
Nurses	78	78	100
Pharmacists	14	6	43
Pharmacy technicians	28	11	39
Laboratory managers	4	0	0
Laboratory technicians	17	10	59
Phlebotomists	15	0	0
Clinical test counsellors	21	2	10
Total	227	141	62

*Available budget would not require new budgetary allocation approval and currently exists to serve non-antiretroviral related capacity needs.

personnel needs for implementation of HAART could be met by filling existing vacancies that have already received budgetary allocation. The largest shortfalls in personnel requirements are among pharmacy technicians (17/28 positions still requiring budgetary allocation), phlebotomists (15/15 still requiring budget), and clinic test counsellors (19/21 still requiring budget). Many categories of workers required for the implementation of HAART, such as specialised medical counsellors, phlebotomists, and community health volunteers, are not widely available in Botswana (Table 4).

DRUG DISTRIBUTION AND STORAGE

Recommended drug regimens were selected by the Clinical Advisory Committee on the Management of HIV/AIDS, an independent task force of local clinicians and pharmacists. A number of factors will affect the timely provision of HAART. The approval and ordering process for antiretroviral drugs can take 1 to 3 months

FIGURE 3. Proposed testing schedule for the Botswana population compared with the traditional Western testing schedule (based on American and European published clinical guidelines). q3mo = quarterly; q6mo = 6 monthly

Test	HIV diagnosis		Eligibility for HAART		Therapy initiation		Monitoring of patients receiving HAART		Monitoring of patients not receiving HAART	
	Proposed	Traditional	Proposed	Traditional	Proposed	Traditional	Proposed	Traditional	Proposed	Traditional
Rapid	2	—								
ELISA	—	1	1	—						
CD4			1	1			q3mo	6wk-q3mo	q6mo	q3mo
Viral Load			—	1	1	—	6wk-q3mo	6wk-q3mo	—	q3mo
BCC			1	1			6wk-q3mo	6wk-q3mo	q6mo	q3mo
Blood chemistry			1	1			6wk-q3mo	6wk-q3mo	q6mo	q3mo
Reason for changes	Rapid tests are more affordable, as accurate as ELISA* and can be carried out in the clinic alongside counselling		Longer timeframes for ELISA can save capacity and cost for HAART eligibility; capacity for viral load testing is more limited than capacity for CD4 testing		Viral load test required to establish baseline for HAART for patients who begin treatment		Viral load is sufficient for indication of HAART efficacy		Viral load not necessary as eligibility for HAART is based on CD4 count; conducting tests on a biannual basis is sufficient for demand management	

■ Altered protocol

*Recent local study shows 100% negative predictive value for Algorithm (Determine And HemaStrip) and Oraquick; 99.5-100% positive prediction value.

(3 months is required for the standard open public tender process) and delivery of drugs may take up to 4 months, primarily due to shipping time and importation procedures. In addition, although adequate physical space exists at the Central Medical Stores, satellite locations are not equipped to handle an increase in supply of drugs, refrigeration needs, or security requirements.

TESTING SCHEDULE AND CAPACITY

The team developed a proposed preliminary testing protocol applicable to Botswana conforming to interna-

capacity of Botswana to adequately support and counsel patients receiving HAART was evaluated. The proposed resource requirements necessary to meet the counselling need for the immediate demand of approximately 19,000 target patients in year one are as follows: 12 nurse managers (each possessing at least 5 years' experience), 40 social workers (educated to degree or diploma standard), and 346 community health workers with secondary school education. However, the four largest non-government organisations in the country have over 2000 trained counsellors working in the community who

evaluating clinical indicators and laboratory tests, monitoring adherence, resistance and adverse effects in a fully integrated manner are required to treat large numbers of patients on antiretroviral therapy. The team also found a severe shortage of physical space in which to support the infrastructure required to support all aspects of the programme. In particular, rooms for consultation, adherence counselling, and drug dispensing.

RECOMMENDATIONS FOR IMPLEMENTATION

To ensure high-quality implementation of the programme, the team recommended five key actions:

1) The launch of an effective Information, Education, and Communication (IEC) campaign. A national, community, and clinic-level campaign should be initiated to communicate to patients the benefits and limitations of therapy, their eligibility for treatment, how to access treatment and, most importantly, how to prevent HIV transmission. The communication strategy should focus on reducing the stigma of being HIV-positive and the promotion of an environment in which people are willing and able to come forward for HIV testing. In addition, IEC material would be developed to support the adherence counselling provided by healthcare workers.

2) Implementation of project management and evaluation. The complex, phased-expansion of healthcare requires a sound project management team with committed support from the Government of Botswana. A multi-disciplinary team, working with the

TABLE 5. Capacity of Botswana to implement proposed HIV testing schedule

Test	(numbers are per day across four sites)	
	Requirements at 12 months*	Current capacity
Rapid	450	0
ELISA	120	1150
CD4 cell count	490	40
Viral load	460	0
Blood cell count	570	1000
Blood chemistry	570	1000

*Assuming simultaneous enrollment across four sites and a constant rate of weekly patient enrollment.

tional testing standards but modified in accordance with the prevailing resource constraints (Fig. 3).

Botswana possesses reference laboratories at tertiary care centres in Francistown and Gaborone. There is currently sufficient capacity for enzyme-linked immunoabsorbant assay (ELISA) tests, blood cell counts, and blood chemistries, but minimal capacity for rapid HIV tests, CD4 and viral load tests (Table 5).

COUNSELLING INFRASTRUCTURE

Given the importance of ensuring patient adherence to HAART, the

could provide a valuable source of counselling support.

INFORMATION TECHNOLOGY AND PHYSICAL SPACE

There is a low level of IT in hospitals and clinics in Botswana, and hospitals are still using paper-based systems for record-keeping and data capture.

The establishment of a basic IT infrastructure with associated training is required for capturing and storing patient data at each site, with the possibility of scaling up to a national patient information system. Follow up of scheduled appointments,

Ministry of Health and the NACA, has been established to implement the initial steps toward the launch of the programme. In the short-term, a dedicated management team will be necessary to drive implementation in each of the four target areas.

3) Consensus building. To avoid redundancy and to optimise use of available resources, coordination of initiatives and a consensus of mutual goals must be arranged between the different non-government organisations, international agencies, and private companies that will be involved in the programme.

4) Overcoming barriers to HAART. As only approximately 10% of HIV-positive individuals in Botswana are aware of their HIV status, it is critical that the barriers preventing patients from presenting early (rather than waiting until they became sick) are overcome. To this end, effective testing at the national level is a critical first step, supported by the IEC

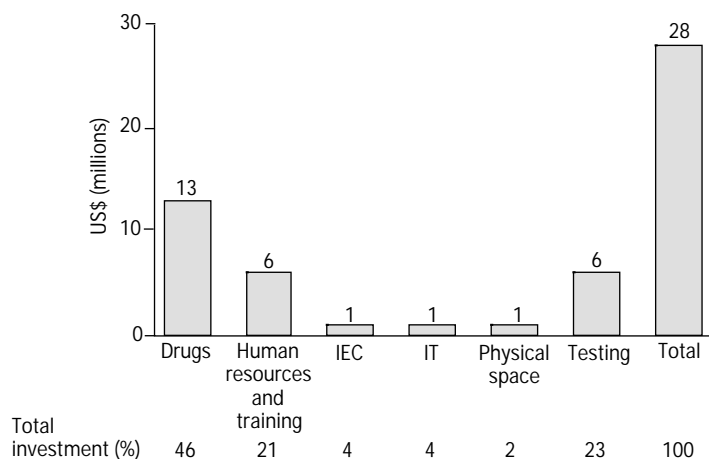
campaign. It is recommended to immediately increase the number of stand-alone Voluntary Counselling and Testing Centres from 3 to 16 to ensure validation and approval of rapid tests. The introduction of routine HIV testing at each site and extending HIV testing to clinics and hospitals should also be considered.

5) Managing risk. Initiation of a programme of this magnitude involves elements of risk related to deviations from the planned model. These risks include the development of rapid resistance to HAART, a breakdown in management processes, low patient adherence, theft or loss of drugs, and the risk of lower or higher demand and/or uptake of HAART than anticipated. The consequences of these risks may include increased need or redundancy of human resources and physical space, increased drug costs, political tension, and compromised quality of care. Two levels of risk planning need to be implemented: prevention of risk and mitigation of its impact.

COST ESTIMATES

Using direct costing methodology for all the relevant operational and capital expenditure (without depreciation), the estimated total cost for the first year of the National AIDS Treatment Programme, based on a target of approximately 19,000 patients, would be US\$28 million (equating to a cost per patient of approximately US\$1500). Approximately 46% of this cost would be attributable to drug procurement and distribution based on the recommended treatment regimens,¹¹ 23% to building testing facilities and purchasing testing reagents, 21% to human resources and training, and 10% to IEC, IT, and physical space (Fig. 4). After 1 year of the programme, there would be a dramatic increase in the number of patients who would need HAART, as well as a requirement for more expensive second-line drugs as patients become resistant to first-line therapy. This would bring the estimated total cost of the national programme for a 5-year period to US\$680 million. A substantial portion of these costs could be met by the Government of Botswana with organisations such as The Merck Company Foundation, the Bill & Melinda Gates Foundation (through ACHAP), the US Centers for Disease Control, and the Global Fund to Fight AIDS, Tuberculosis and Malaria providing contributions both in the initial stages of the programme and during the first three to five years. ACHAP has a total commitment of \$100 million over five years to support HIV/AIDS prevention, care, treatment, and support initiatives in Botswana.

FIGURE 4. Cost estimate based on the capacity to build up requirements during year one



DISCUSSION AND STRATEGIC RECOMMENDATIONS

Definitive data from the number of patients with HIV or AIDS in Botswana who are eligible for antiretroviral therapy were used to evaluate the total latent demand for HAART. The team concluded that addressing this demand in the first year would be impossible due to the overwhelming burden it would place on the health-care system in Botswana. The targeted approach that was adopted was considered to be more manageable, was capable of facilitating responsible delivery of treatment both for counselling and for drug adherence, and complemented existing targeted initiatives such as the mother-to-child transmission of HIV and voluntary counselling and testing programmes. Selection of target groups was based on the understanding that these populations would be most likely to have current interactions with the health system, would adhere to the given regimens, and would not share their medications.

Analysis of healthcare infrastructure demonstrated that skilled human resource is the major limiting factor in creating a National AIDS Treatment Programme. Even in the relatively successful economy of Botswana, there was a critical shortage of trained healthcare workers, including physicians, nurses, pharmacists, laboratory technicians, and counsellors. To address this issue, wide-scale recruitment is necessary, with significant investment in training all personnel. In the short term, this problem may be solved by the creation of partnerships

with medical institutions in Europe and America to provide short-term relief staff. Alternatively, the provision of overtime pay may encourage existing healthcare workers to extend their working hours.

While the feasibility of antiretroviral treatment was the purpose of this assessment, strengthening the capacity in the diagnosis and treatment of opportunistic infections, and in palliative care, as well as in the management of other diseases is recommended as the impact of the HIV epidemic on the healthcare system will only partly be addressed by the introduction of antiretroviral therapy.

The second issue relates to the distribution and storage of drugs. Although Botswana has high-quality drug procurement, storage, and distribution systems that have historically been successful in securely distributing drugs throughout the country, there are a few key bottlenecks that would affect the timely provision of HAART. To overcome this problem, the government needs to deal directly with drug manufacturers to avoid the long delays involved with open tenders and intermediaries. Drug facilities across Botswana require investment to expand space, improve cooling systems, and upgrade security systems. Finally, additional drug distribution personnel are required to manage the additional workload associated with implementation of HAART.

Although Botswana has a number of good reference laboratories in

Francistown and Gaborone, the capacity of these laboratories for HIV testing, CD4 cell counts, and assessment of viral load is currently low. Because these tests are critical for the screening, identification, and management of HIV-positive patients, closing this gap by building on the current infrastructure is essential. In the short term, all CD4 and viral load testing should be carried out in two central reference laboratories. Further expansion of CD4 and viral load testing capacity should be considered, the extent of which will depend on patient demand and the turn-around time of testing samples. CD4 cell count will, in many cases, determine the start of antiretroviral therapy, and viral load monitoring will provide guidance in adherence management. CD4 cell counts and viral load will be monitored regularly in accordance with generally accepted clinical practice. Operational research is needed to assess whether patients can be treated with antiretrovirals guided by clinical indicators and without monitoring their immunologic and virologic status. The capacity for rapid HIV testing requires expansion to complement ELISA tests and to rapidly increase the number of people who know their HIV status.

Counselling, support, and health education services are provided through government as well as non-government organisations. At the community level, government-sponsored community outreach and care is provided through clinic-based family welfare educators as well as through an

extensive home-based care network for patients with clinical AIDS and other chronic and/or terminal diseases. However, with the overburdened clinic system and the rapidly increasing number of patients requiring home-based care services, there is little capacity available to address the needs of patients receiving HAART. Due to the large number of trained counsellors from non-government organisations currently working in the community, close links and coordination with these organisations will offer a critical short-term measure. In the longer term, the country must invest in additional human resources, infrastructure, and systems to support drug adherence.

To address the need for additional physical space, the team identified a number of potential solutions. These include reassigning the use of rooms, identifying and refurbishing unused space and buildings, sharing space with existing programmes and/or institutions, and the conversion of

unused hospital premises into specialised AIDS treatment centres. In the short term, it is recommended that rapidly deployable structures such as pre-fabricated buildings and partitions be used to supplement existing structures.

These strategies need to be supported by a fully developed IT infrastructure. Although this would entail initial high-capital expenditure, the benefits of an IT-based infrastructure would be indispensable, allowing universal and immediate access to patient data, minimisation of lost data or inaccurate data transfers, improvement in overall efficiency of inventory management and security, effective monitoring of patient adherence to counselling sessions and retrieval of HAART, and facilitation of patient referral between different healthcare personnel. Implementation of an IT infrastructure would also aid in clinical decision-making and provide online learning for doctors newly trained in HAART.

During this project, it became clear to the team that the most practical approach would be to develop the programme in the two largest towns (Gaborone and Francistown) before introducing it in the smaller towns of Maun and Serowe. This sub-pilot approach will allow early learning experiences to provide opportunities to prospectively address potential risks prior to national implementation and the earlier availability of HAART in these regions. The team suggests that other African countries with high proportions of HIV-positive individuals, and providers of healthcare funding use similar rapid assessment methodologies to plan resources and provide solutions to overcome resource constraints. The lessons learnt during the implementation of the Botswana anti-retroviral programme and the impact of antiretroviral introduction on the effectiveness of prevention efforts will be reported in separate papers.

CONCLUSIONS AND ACKNOWLEDGEMENTS

This assessment of the Botswana healthcare system and infrastructure demonstrated that a National AIDS Treatment Programme can be realistically and practically implemented using a phased roll-out approach targeting select patient groups in key catchment areas. Strategic recommendations to implement the programme should involve wide-scale recruitment of skilled human resources, strengthening the capacity

for HIV diagnosis and testing, the implementation of counselling, education, and support services, and a fully developed IT infrastructure.

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