THE AFFORDABILITY OF ANTIRETROVIRAL THERAPY IN DEVELOPING COUNTRIES: WHAT POLICYMAKERS NEED TO KNOW

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ABSTRACT

Objective: The objective of this paper is to assist policymakers in developing countries and international donors by providing an outline of economic information needed to make a decision regarding the purchase of antiretroviral (ARV) drugs.

Design: The following paper: 1) reviews existing experiences of policymakers in developing countries regarding the purchase of ARVs, 2) identifies issues that would need to be addressed and data that would be required in order to make more informed decisions regarding this issue, and 3) develops a cost-benefit model that could be utilized in designing an economic research project evaluating the economic costs and benefits of antiretroviral therapy.

Results: A review of experiences with this issue reveals that there are growing political, legal and budgetary pressures for countries to make tenable decisions regarding the purchase of ARVs. An economic model describing the costs and benefits of ARVs would be useful in this decisionmaking process, but unfortunately much of the required data for producing such a model is neither available or in the process of being collected.

Conclusions: It is imperative that economic data be collected to better inform policymakers in developing countries on this issue. It is recommended that such economic data be collected as organizations such as UNAIDS initiate their medical assessments of ARVs in developing countries.

Keywords: Antiviral therapy, Health-Care/economics, Models/projections

How should policymakers in developing countries address the very difficult issue of purchasing antiretroviral (ARV) drugs? ARVs are providing extraordinary results among people with AIDS (PWAs), in some cases bringing patients back from the final stages of illness to again becoming active, productive members of society. The success of ARVs in developed countries is creating increasing pressure on policymakers in developing countries to provide these drugs for their own populations.

Unfortunately, ARVs are very expensive, possibly requiring a lifetime of treatment. Few, if any, drugs with this price tag are currently available in developing countries. The purchase of ARVs may ultimately involve using limited financial resources to care for PWAs denying access to treatment and preventive services for those with other illnesses. Thus it is important to assure that this type of care is, in fact, cost-effective and sustainable.

Do countries have a human rights obligation to provide ARVs to their populations? Should pharmaceutical companies be required to provide these drugs at a discounted price to poor people in developing country? Should insurance companies include ARV therapy among the services they offer? Do international donors have a moral obligation to assure that such critically needed drugs are available globally?

The following paper will review the information that is available to policymakers regarding this issue. It will also propose an economic model that could be applied for assisting policymakers to make the difficult decision as to whether or not to purchase these drugs.

BACKGROUND

In March of 1987, AZT became the first ARV approved for the treatment of persons with AIDS (PWAs) in the United States. The next ARV, ddI, was not approved in the U.S. until October 1991. By December of 1995, saquinavir, the first protease inhibitor, received approval from the FDA. Over the next 16 months, 3 more protease inhibitors received approval.

There are currently three types of ARVs that have been approved by the U.S. Food and Drug Administration (FDA): 1) nucleoside reverse transcriptase inhibitors (AZT, ddI, ddC, 3TC and d4T), 2) non-nucleoside reverse transcriptase inhibitors (nevirapine and rescriptor) and 3) protease inhibitors (saquinavir, ritonavir, indinavir, and nelfinavir). The ideal treatment strategy for PWAs involves the use of a protease inhibitor and two reverse transcriptase inhibitors. The combination of these three drugs has become known as "triple combination therapy".

Results from medical studies on triple combination therapy have been extremely impressive, especially among patients who have never been exposed to an ARV. Studies of triple combination therapy have shown that viral loads can be reduced by 99 percent [1] and mortality can be reduced by as much as half [2,3]. One study showed that between 65% and 81% of those with the triple combination therapy had reduced their level of virus to undetectable levels after 6 months of treatment [4].

Despite these remarkably positive results, the 93 percent of the people infected with HIV who live in developing countries cannot obtain ARVs. Even within developed countries, some have questioned the wisdom of offering ARVs to the poorest members of society [5]. When the issue of access to ARVs is raised in developing countries, the

response of policymakers has typically been that these drugs are too expensive or that the purchase of other drugs should take priority.

Reductions in the price of AZT and its use in preventing the transmission of HIV from a mother to her child has encouraged its expanded use in some developing countries. Yet it is generally agreed that such monotherapy (using only one ARV drug) is less than ideal, and in fact may make patients less responsive to future treatment regimens.

As the effectiveness of ARVs is becoming known and there are expectations of price decreases, the issue of access to these drugs is becoming critical. In some African countries (i.e., Cote D'Ivoire, Zimbabwe, Uganda, South Africa, etc.), strong arguments are being put forward by policymakers and medical professionals for the public and private sector, as well as international donors, to collaborate in order to assure that these drugs are available to all PWAs [6]. Those who argue in favor of the purchase of ARVs have based their positions largely on political, ethical and human-rights grounds. Meanwhile, those opposed to the purchase of ARVs have argued that economic realities make the purchase of such drugs in Africa infeasible.

In "wealthier developing countries" (i.e., Brazil, Colombia, Mexico, Thailand, etc.), ARVs are already being subsidized by the public sector, with many other countries expected soon to follow. Peter Piot, the Director of UNAIDS, noted that "There are other countries -- such as Brazil, Thailand, South Africa -- that are near the top of the income distribution of developing countries; there, access to the latest new antiretrovirals and other drugs is not a naive dream. We are working with the governments to try to negotiate lower prices, by bulk procurement for example." [7]

No studies are currently available that adequately quantify the economic benefits of using triple combination therapy. However, it is probable that the use of ARVs will lead to changes in: 1) treatment costs (drug procurements would lead to much higher costs, but could be at least partially offset by decreases in the need for inpatient hospital visits), 2) the productivity of individuals (productivity will probably increase as workers can extend their time within the workforce), and 3) the number of new infections (new infections could potentially be reduced if a reduction in viral load leads to reduced infectivity and no negative change in risk-taking behavior). The problem is that there is no solid data to estimate the magnitude associated with any of these three assumed impacts. As a result, countries are either making a commitment to purchase ARVs for an indefinite period of time without any knowledge of their future costs or benefits, or conversely they are denying access to these drugs for PWAs based on the assumption that the costs of ARVs far exceeds any economic benefits. In either case, policymakers are making critical, life-or-death decisions based on very limited data.

OBJECTIVE

The following paper attempts to address the following objectives:

1. Describe the early responses in developing countries that are considering the purchase of, or have recently decided to purchase, ARVs.

2. Identify issues that would need to be addressed in determining the costs and the benefits of ARV therapy for people with HIV/AIDS. This cost-benefit analysis could then be used as one tool by policymakers for determining if they should purchase these drugs.

3. Design a cost-benefit model that could be used in developing an economic research project assessing the costs and benefits of antiretroviral therapy.

EARLY POLICY RESPONSES

The early policy responses of developing countries has generally been confused and reactive, with very little consideration of the long-term economic impacts associated with decisions made. In response to the severely limited access of developing countries to ARVs, UNAIDS is launching a pilot program to offer these drugs to a number of infected individuals in Ivory Coast, Chile, Vietnam and Uganda. It is not clear, however, if these pilot studies will address the very problematic but critical issue of affordability. Even if ARVs are effective in these countries, will they be affordable and will countries or donors be able to sustain this investment?

Most of the countries that are considering the purchase of ARVs are in Latin America, where the cost of treatment tends to already be high and where there are a limited number of AIDS cases. In many Latin American countries, there are likely to be stronger economic arguments for purchasing these drugs.

In Costa Rica, the only ARV publicly available is AZT, which is offered only to women during pregnancy. Recently, the Social Security Institute was asked to perform an additional review of the country's policy regarding the possible purchase of invirase, HIVID and AZT. This review concluded that the purchase of ARVs would consume 7 percent of the budget of Social Security Institute, a cost that was deemed to be too high for that institution.

A recent Supreme Court decision in Costa Rica determined that the country's Social Security Institute does have a legal obligation to provide access to these drugs [8].

As a result, it is likely that Costa Rica will purchase ARVs on at least a pilot basis, although the country is trying to negotiate a better price with the pharmaceutical companies (current negotiations have reduced the price of these drugs to US$7,000 per patient per year). It remains unclear if these ARVs will be purchased for only PWAs (about 700 people), or all people who are infected with HIV (5,000 to 7,000 people).

Meanwhile in Colombia, approval was given early in 1997 by the Ministry of Health for the purchase of ARV drugs, including protease inhibitors. Despite this approval, PWAs could not initially gain access to ARVs, and were still required to sue the government in order to obtain access. This unusual arrangement was created by the Ministry of Health's initial concern that the country may be making an unretractible commitment to the purchase of ARVs. However, this situation subsequently changed, leading the Colombian Social Security Institute to pay US$50 million for access to ARVs by 4,000 patients in 1997.

ECONOMIC AND POLICY ISSUES

In order to assist countries in developing policies regarding the purchase of ARVs, it is first necessary to identify the contributing issues that would need to be answered by policymakers to make a well-informed decision. While many of these questions may never be fully answered, it is useful to identify these issues in order to develop research protocols that would help to provide policymakers with clearer direction and to design a cost-benefit model.

Who will receive treatment?

Most countries are considering one of three options for providing access to ARVs. The first option involves providing triple combination therapy, but only to people who

have full-blown AIDS. This is the scenario currently being confronted by countries such as Colombia, where it is mandated that PWAs be offered access to these drugs.

The second option involves providing access to all people who are infected with HIV. This is the option currently being faced by Brazil and most developed countries. Guidelines concerning the optimal treatment of PWAs indicates that "there is no good reason not to start antiretroviral therapy as soon as the patient is mentally ready for it." [9] While there are certain medical advantages to treating patients as early as possible, this option would require the identification of persons with HIV and would require providing access to a much larger population than the first alternative, all of which could involve a very high cost.

The third option involves providing access to ARVs (generally only AZT) to pregnant women over a short period of time. This scenario is the one currently being confronted by most African countries. Data from studies performed with pregnant women have revealed that the probability of mother-to-child transmission can be reduced by about two-thirds when the woman is provided AZT [10]. The problem with this approach is that AZT monotherapy, while an appropriate treatment for preventing transmission to the child, may represent a suboptimal treatment for the woman. While AZT monotherapy can reduce viral loads by 2-5 times for the women, a combination of ARVs can reduce viral load by 100 - 1,000 times [11]. Furthermore, making AZT available to women only during pregnancy does not represent a sustainable treatment for those women and may reduce their responsiveness to other drugs in the future.

What ARVs will be offered to patients (reverse transcriptase inhibitors alone, or triple combination therapy)?

It is generally accepted that the most effective form of treatment is a combination of three ARVs, including at least one protease inhibitor [12]. However, because protease inhibitors are new and relatively expensive, many developing countries do not view providing access to this full complement of drugs as an affordable option. Yet providing only reverse transcriptase inhibitors, while having positive short-term benefits, may actually lessen the effectiveness of future drug treatments. It is therefore necessary for policymakers to determine if they wish to purchase suboptimal drugs that are less expensive, or to purchase what is considered to be currently optimal therapy, but at a significantly higher price.

How effective will these drugs be?

The effectiveness of ARVs depends largely on the ability of the patient to consistently comply with what can be complicated instructions. In one study, it was found that only 26 percent of patients with AIDS were properly adhering to the instructions for AZT therapy. This inappropriate use may be even worse with protease inhibitors, as patients often are required to take numerous pills throughout the day (some with meals, others on an empty stomach), some of which require refrigeration that might not be available.

Another issue concerns the actual efficacy of the drugs. Recent studies indicate that for a certain percentage of all PWAs, ARVs are ineffective. One recent study at San Francisco General Hospital revealed that the protease cocktails failed within 6 months for 53% of patients [13].

How will the cost of AIDS treatment change with the introduction of ARVs?

Currently there is limited data indicating how treatment costs are likely to be affected by the introduction of antiretrovirals. However, there are indications that there will be some reductions in non-drug treatment costs due to the availability of ARVs. It is not clear if these benefits are likely to outweigh the costs associated with the purchase of these drugs. It has been argued in Britain that "increased drug costs are likely to be more than offset by savings in healthcare resources elsewhere." [14] However, limited data is available to support this contention. Additionally, it is not clear if these cost savings can be achieved in developing countries. It has been proposed, for example, that cost savings cannot be achieved by countries with a per capita income below US$1,900-$8,800 [15].

While ARVs are expensive, it is also clear that the full cost of treating a PWA, even in the absence of ARVs, can also represent a very high cost for many developing countries. While the introduction of ARVs will almost certainly increase the overall cost of medications for patients with AIDS, some other treatment costs may be reduced.

In the CAESAR trial performed in Canada, Australia, Europe and South Africa, patients were randomly selected to add a placebo, lamivudine, or lamivudine and loviride to their existing therapy. The study found that the addition of lamivudine reduced the number of patients needing a hospital admission (11% in the placebo group and 6% for those with lamivudine), the number of unscheduled outpatient visits (15% in the placebo group and 10% for those with lamivudine) and the number of patients needing at least one prescription for an HIV-related illness (43% in the placebo group and 30% for those with lamivudine). This data suggests that on an annual basis, the addition of ARVs may significantly reduce inpatient visits, unscheduled outpatient visits and non-ARV drug needs. Whether these benefits completely offset the costs of the ARVs is unclear.

Another study done at St. Vincent's Hospital and Medical Center in New York found that there was a significant decrease in the average length of hospitalization (from 15 to 12.6 days) as a result of the availability of ARVs. In addition, the introduction of protease inhibitors had resulted in a 28 percent decrease in inpatient visits between 1994 and 1996 and a corresponding 21 percent increase in the number of outpatient visits [16]. This data suggests that the increased cost of drugs was at least partially offset by shifts from more expensive inpatient treatment to less expensive outpatient care.

A third study in France revealed that there was documented a very small increase in the overall cost of treatment (US$12 per patient per month) as a result of antiretroviral treatment. However, this study also concluded that the overall health benefits, including a 41% drop in hospitalizations, a 41% drop in new AIDS cases, and a 69% reduction in deaths, were worth this additional minimal cost [17].

Finally, a study at St. James Hospital in Dublin Ireland revealed that hospital admissions for patients with AIDS was reduced by 40 percent due to their access to ARVs and that death rates were dropping dramatically [18]. Another unexpected positive externality found by this study was that many injecting drug users were seeking methadone treatment at a greatly increased level in order to qualify for access to ARVs.

What is the best negotiable price for these drugs and how will this change over time?

ARVs are expensive. Retail prices for all three drugs is between $10,000 and $14,000 per year in developed countries [19]. While the pharmaceutical companies recognize that this price is not affordable in most developing countries, they are also concerned that offering ARVs for a discount in developing countries could create

arbitrage opportunities that could significantly reduce their profit levels (purchasing ARVs at a lower price in developing countries and reselling them in developed countries). They are also concerned that there will then be demands by health insurance providers and activists in developed countries to reduce their prices to levels in developing countries. As a result, countries such as Costa Rica have only been able to negotiate a price equivalent to $7,000 per patient per year for invirase, HIVID and AZT. While this is less expensive than the market price in developed countries, it still represents nearly 3 times Costa Rica's per capita income ($2,610).

Countries such as Costa Rica, that have relatively few AIDS cases, are unlikely to be able to negotiate a significant discount with the pharmaceutical companies due to their relatively small-scale purchases. On the other hand, countries such as Brazil, which do have large numbers of AIDS cases (and thus are able to negotiate a better price), still must pay for such a large quantity of the drugs that they may consume an overwhelming proportion of the country's health budget.

In turn, pharmaceutical companies are asking developing countries to sign extended contracts for the purchase of ARVs, in order to assure that there is a steady demand for the drugs in the future. However, there are indications that the price of antiretrovirals will decline in the near future. For example, the price of AZT has declined from US$10,000 in the late 1980s to the current price of less than US$3,000. Thus countries that sign extended contracts with pharmaceutical companies may find themselves locked into prices that are higher than the existing market price.

How will ARVs affect the productivity of PWAs?

In developing countries, where an overwhelming majority of those HIV-infected are between 20 and 45 years old, improved health and life expectancy will likely add years of labor productivity (including decreased absenteeism, less recruitment and retraining needs, etc.). While clinical trials have been able to address how ARVs are able to affect morbidity and mortality, no studies have been initiated to address how access to these drugs might affect the productivity of workers. This is relevant because many countries are only willing to purchase ARVs if there is some economic return associated with their purchase. Thus research on the productivity gains associated with the purchase of ARVs would be extremely useful as a tool for informing policymakers about the full scope of benefits available from offering ARVs.

On the other hand, it is important that this research not be used for purposes of discrimination in providing access to these drugs. For example, the poor and/or homeless should not be denied access to drugs due to their current lack of productivity. Similarly, activities such as childrearing should be properly valued, despite the lack of monetary income assigned to such activities.

How long will ARVs be offered to patients?

A critical question for any government considering the purchase of ARVs concerns how long they will have to continue to provide these drugs to patients. Research based on mathematical models has indicated that the virus may be sufficiently suppressed after 2.3 to 3.1 years so that treatment can be discontinued [20]. Research with a very limited number of patients indicates that it may be possible to suppress the virus after one year of treatment, such that additional treatment becomes unnecessary [21].

Other research has observed that even among patients who have reduced their viral loads to undetectable levels for a year, discontinuation of therapy causes levels to return to baseline in only 10 to 14 days [22]. These data suggest that patients may have to continue to receive ARVs for the rest of their lives.

Will ARVs affect the total number of people with HIV and AIDS?

As the viral load of PWAs decreases, it is conceivable that those taking ARVs will be less likely to transmit the virus to others. While the data is limited, it does seem likely that a reduced viral load would reduce the probability that an infected individual would infect others. One study in Italy of 436 couples in which the men were HIV-positive and the women were initially HIV-negative found that the probability of the women becoming infected by their partners was reduced by 50 percent when the man was using AZT (after adjusting for disease progression) [23]. This suggests that the use of ARVs may actually succeed as both a curative agent and as a means of HIV prevention.

Another study conducted in Switzerland and the USA revealed that the use of ARVs resulted in a significant decline in levels of HIV in semen [24]. This study concluded that ARV therapy might reduce the spread of HIV. In countries where the epidemic is at an early stage and PWAs can be identified and treated, the use of ARVs could theoretically cause the epidemic to stabilize.

Conversely, it is feasible that the use of ARVs will increase the spread of the epidemic. This argument is based on two factors: 1) ARVs increase the length of an individual's life and therefore increases the period of time during which they can infect others, and 2) the availability of ARVs may increase the possibility that both infected and

uninfected individuals will take risks which in turn will increase the likelihood of new infections.

There is some data which now suggests that the existence of ARVs is increasing the risk-taking behavior of some groups. Survey results of 54 gay men in San Francisco showed that some were already taking increased risks due in part to the availability of ARVs [25]. Fifteen percent of respondents indicated that that had already taken a chance of getting infected due to the availability of new AIDS treatments.

Another study by the Johns Hopkins School of Hygiene and Public Health found that a significant portion (39 percent) of gay men had engaged in unprotected anal sex over the last 6 months [26]. The study in part attributes increases in risky behavior to false perceptions that ARVs represent a cure for the disease.

MODEL DESIGN

The issue of purchasing ARVs should include information on the potential economic costs and benefits to the individual patient and to society. The following identifies some of the critical advantages and disadvantages of purchasing ARV drugs.

SOCIAL AND ECONOMIC COSTS AND BENEFITS OF PURCHASING ARVs	
Benefits	**Costs**

• Potential reductions in hospitalization costs
• Increased productivity of the labor force
• Potential reductions in new infections due to lower viral loads
• Increased stability and longevity of families
	• Potential increases in overall treatment costs
	• Possible "crowding out" of people with other illnesses
	• Possible increases in new HIV infections due to :
	  - longer life (a longer incubation priod could lead to more opportunities to spread the disease
	  - return to risky behaviors

In order to assess the magnitude of these costs and benefits, it will be necessary to initiate economic research in countries where ARV therapy may become available in the foreseeable future. Such research should monitor the changes in treatment costs, productivity and quality of life associated with the use of these drugs. There are 3 ways in which this type of analysis could be carried out:

1. Randomly select patients infected with HIV (in a developing country where ARV therapy is currently not available) to receive ARVs and compare them to a control group that would receive the same level of care as the general population in that country.

2. Collect baseline information from PWAs regarding treatment costs and productivity, and then compare this to the treatment costs and productivity of PWAs after receiving ARV therapy.

3. Compare treatment costs and productivity across countries, where patients are similar in many ways except for their access to ARV therapy.

The first approach for performing such an analysis (randomly assigning patients to therapies in order to determine the costs and the benefits of such therapy) would probably be the most effective approach, as it would eliminate many of the externalities which could negatively influence the results from the other two approaches. However, politically and ethically this approach may not be acceptable, especially to the control group.

The second option would be to compare patients receiving ARV therapy with a baseline prior to receiving the drugs. This approach would also potentially produce flawed results, as newly diagnosed patients with AIDS not receiving ARV therapy would

be expected to have a quickly declining level of productivity and rapidly increasing

treatment costs that would not be adequately represented by the baseline data.

The third option would be to compare data across countries where drugs were and

were not available. This may be the most acceptable approach, as it would involve

providing critical information to both countries, without denying care where it otherwise

might be available. The approach would need to take into consideration, however,

possible economic externalities that could affect the results (i.e., changes in each country's

national economies).

In order to address the relevant economic issues concerning the purchase of ARVs

using any of these approaches, it would be necessary to design a basic model which would

identify the variables necessary to evaluate the costs and benefits of such therapy.

Model Requirements

In order to address the issue of costs and benefits, it is critical that certain data be

identified for incorporation into an economic model. A spreadsheet model was developed

which incorporates existing data regarding the use of antiretrovirals and information that

was available concerning the cost of AIDS in Costa Rica.

The data from Costa Rica was collected in 1996, prior to the availability of

antiretrovirals in the country. This example is being used for illustrative purposes, as

much of the data about the effectiveness of antiretroviral are estimates from other

countries and would need to be collected specifically in Costa Rica. In order to test the

sensitivity of this model, optimistic and pessimistic scenarios were developed regarding the

costs and benefits of using these drugs in Costa Rica.

TABLE 1
ILLUSTRATIVE MODEL OF VARIABLES REQUIRED FOR ASSESSING THE COSTS AND BENEFITS OF TCT IN COSTA RICA

VARIABLES	ASSUMPTIONS
Medical Assumptions	
Annual Failure Rate for TCT	25%
% of PWAs Receiving TCT	80%
% Reduction in Hospital Days (TCT)	16%
% Reduction in Inpt Visits (TCT)	28%
% Reduction in Outpt Visits (TCT)	33%
% Reduction in Non-TCT Drug Cost	30%
Number of years of TCT required	3 years - lifetime
Impact of TCT on # of New Infections	None
Economic Assumptions	
Cost of TCT	$7,000
Other Costs of TCT	$828-$1,504
Discount rate	5%
Cost/Day of Hospitalization (No TCT)	$192
Number of Hospital Days	36
Cost of Drugs/Day (No TCT)	$17
% of PWAs receiving inpt care	99%
Cost/Outpatient Visit (No TCT)	$32
Annual Outpt. Consultations for PWAs	61
% of PWAs Receiving Outpt Care	71%
Demography of People with HIV/AIDS	
PWAs	685 (1997)
	1,064 (2000)
	1,817 (2005)
PWHIV	8,440 (1997)
	11,640 (2000)
	17,030 (2005)
Annual Income in Costa Rica	$4,061
Present Value of Lifetime Income	
Avg. Lifetime Years Productivity	29
Productive Years (PWAs: no TCT)	10
Productive Years (PWAs: TCT)	18

Table 1 contains the variables that would be necessary to assess the costs and benefits of offering TCT in Costa Rica. The values used in this modelling exercise regarding the medical benefits of TCT have been collected from an array of studies that have been performed worldwide and are not necessarily applicable to the situation in Costa Rica. This exercise illustrates the process that would be needed in order to assess the costs and benefits of offering these drugs.

The model assumes that TCT were offered to 80 percent of patients with AIDS (not to all people living with HIV). Thus the drugs would have to be paid for 550 PWAs in 1997. The estimated cost of $7,000 for triple combination therapy was obtained based on ongoing negotiations with the pharmaceutical companies (this is substantially less than the $7,944-$20,224 estimated in other studies. [Gilks study]. It has also been estimated that the cost of additional blood cell counts, CD4 counts, viral load tests and chemistry panels ranges between $828 and $1,504.

Using this model, it is possible to develop estimates using a range of scenarios. Figure 1 illustrates the results from this exercise.

DISCUSSION

This paper has identified some of the unresolved issues surrounding the use of ARVs. While some of these issues are currently being addressed from a medical perspective, none are being addressed from an economic point of view. It is imperative to recognize that assessing the health impacts of ARVs without addressing the corresponding economic issues will not be adequate in assisting policymakers to determine if these drugs should be purchased.

Steps need to be taken to design an economic/policy model that incorporates all of the issues already identified. By drawing on the experience of individuals in the medical and economic professions, it should be possible to determine the affordability of these drugs in countries at various stages of development.

It is proposed that research interventions be initiated to collect the data necessary for inclusion in a model that would better inform policymakers about their options and the corresponding costs and benefits of these options. Countries should be selected based on the relevance of this issue to their own policymaking processes and their ability to collect relevant medical and economic data.

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