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by the Atlantic forest in 17 Brazilian states (6). Other Brazilian states have begun long-term programs based on the BIOTA-FAPESP guidelines. The Brazilian National Research Council (CNPq) is planning a similar initiative and, likewise, the U.S. National Science Foundation recently launched the program, Dimensions of Biodiversity.

Keys to Success

What makes a program on biodiversity conservation simultaneously successful in research, training, and policy (7)? Several external factors may have contributed to progress thus far: a consolidated network of research institutions, graduate programs, and biodiversity researchers in the state of São Paulo; pressure from commodity markets for certification; increasing social awareness of biodiversity conservation and demand for scientifically sound policies; the large network of 64 state parks and reserves; the political will demonstrated by the state secretary of the environment in supporting the program. Political and economic stability in Brazil were also important factors that allowed FAPESP to make a crucial, long-term (10-year) commitment to funding, providing an average annual budget of U.S.\$2.5M.

But particular aspects of the program must also be recognized as important. It is a

research-driven initiative—planned, implemented, and coordinated by scientists—in contrast with most previous Brazilian conservation policies. The funding agency, FAPESP, has de facto political and administrative autonomy, which allows it to invest in long-term scientific programs and to ensure quality through a rigid peer-review standard, which is rare in Brazil. The program is evaluated by an international committee every 2 years (8). Members of the committee represent diverse areas of scientific expertise; one of the members was from the senior administration of the secretary of the environment, which helped bridge the gap between scientists and policy-makers. The fact that the program is fully based on the CBD, which provides an undisputed legal framework, is another crucial factor.

Strong ties with collaborators are also essential. Many technical staff of both the state and the NGOs developed student projects, supported by the BIOTA-FAPESP program, and became strong allies in producing the synthesis and implementing biodiversity conservation and restoration priorities. Further research by independent, external evaluators is needed.

The program has not been successful in all areas. It failed to translate scientific advancements into teaching material for use in schools. It did not study the entire state

well enough to establish priority areas in every watershed, and the marine ecosystems were not studied in the same depth as continental ones. Also, the present distribution and risk of invasive species have not been mapped, and few projects focused on the human dimensions of biodiversity conservation. These gaps were identified during internal and external evaluation in 2009, and are thus priorities in the *Science Plan and Strategies for the Next Decade* (see SOM).

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Supplementary Online Material

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PUBLIC HEALTH

Global HIV/AIDS Policy in Transition

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In 2007, the United Nations Joint Programme on HIV/AIDS (UNAIDS) concluded that “Global HIV incidence likely peaked in the late 1990s” (1), due to “natural trends in the epidemic as well as the result of prevention programmes” (1). The slow decline in new infections together with a recent rise in antiretroviral therapies (ARTs) halted the rise in the estimated number of AIDS deaths at about 2.2 million per year—equivalent to 4% of all global deaths (2). Among adults 15 to 49, the proportion currently infected with HIV (HIV prevalence) plateaued at just under 1% before declining to 0.8% worldwide (1, 3). These trends raise

the question of how global health funding should be rebalanced between AIDS treatment and HIV prevention, as well as other health-care investments.

The cost of universal access to treatment is unsustainable. Medical and ethical considerations endow each patient currently on treatment with a life-long “entitlement” to receive at least his or her current treatment regimen (4, 5). Despite rapid growth in resources, less than half of those in need receive treatment, and five new infections occur for each two new persons put on treatment (3, 6). The World Health Organization (WHO) revised its recommendations regarding when to start treatment, raising the threshold from 200 CD4 cells/μl to 350, which could triple the number of people currently needing treatment (CD4 is a type of white blood cell that is killed during HIV

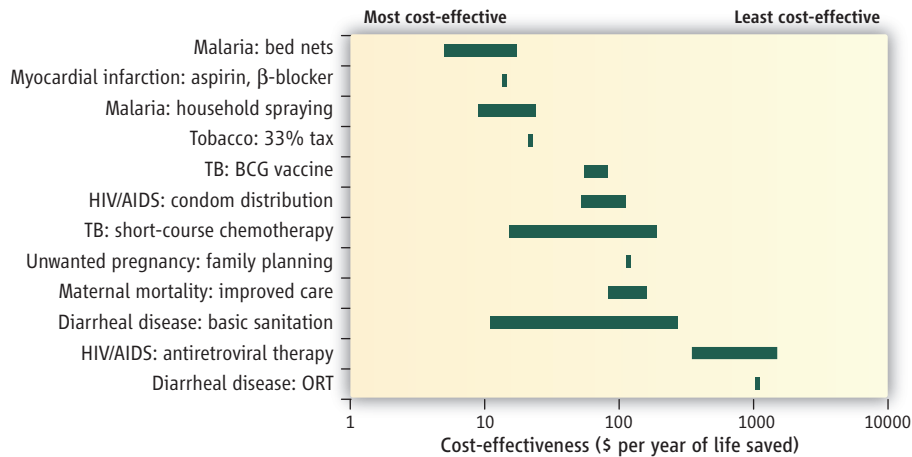
Resource constraints and peaking of the epidemic should lead to a rebalancing of health assistance for developing countries.

infection) (7). Reaching these ambitious targets would require the United States to spend half of its current foreign aid budget on AIDS treatment by 2016 and all of it by 2024 (4, 5).

The current allocation of health assistance to developing countries is far from optimal. One would expect resources allocated to a particular disease to be roughly proportional to the potential ill health averted by those expenditures. But the proportion of development assistance for health that is allocated to HIV/AIDS reached 23% in 2007, whereas the proportion of deaths attributable to AIDS in the developing world is less than 5% (3, 8). In a few African countries, foreign HIV/AIDS assistance exceeds the entire budget of the Ministry of Health (9). The huge influx of donor funding for HIV/AIDS sometimes crowds out other

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Public Health Interventions. Cost-effectiveness estimates in low- and middle-income countries are illustrative of key interventions widely implemented and recommended by international organizations. For details on these and other interventions, see the supporting online material and (14). TB, tuberculosis; BCG, Bacille Calmette-Guérin vaccine for tuberculosis; ORT, oral rehydration treatment. Life-years saved are disability adjusted.

health needs and distorts health priorities, in part, by putting pressure on a meager supply of doctors, nurses, and clinics (4, 9–13).

To maximize a population's health status for a given amount of funding, the international donor community is ethically obliged to spend foreign aid funds and allocate health-care resources as cost-effectively as possible (13). Selected estimates of cost-effectiveness of interventions from the Disease Control Priorities Project (14) are shown in the chart, above. The range is very wide; ARTs for AIDS is one of the least cost-effective. Annually, 15.9 million people die from communicable diseases other than HIV/AIDS and from maternal and perinatal conditions and nutritional deficiencies, most preventable at low cost (15).

Even though institutional change is slow, a review of the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) recommended a shift from "emergency relief" to "capacity building ... for sustainability" and to "greater emphasis on prevention of HIV" (16). The Obama Administration announced in December 2009 that, in addition to funding more treatment, it will accept this recommendation because "preventing new infections represents the only long-term, sustainable way to turn the tide against HIV/AIDS" (17). In January 2010, U.S. Secretary of State Clinton affirmed this rebalancing of health priorities by aiming to "invest \$63 billion over the next six years to help our partners improve their health systems and provide the care their people need rather than rely on donors to keep a fraction of their population healthy while the rest go with hardly any care" (18). This is a signifi-

cant shift from the previous administration's approach.

A World Bank evaluation of its programs warns that the dramatic increase in funds earmarked for HIV/AIDS "may be creating distortions in the rest of the health care system" and concludes that "performance of the HIV/AIDS portfolio has been much lower than that of other HPN [health, population, and nutrition] projects" (19). The overall objective of international donors should be transition to an HIV/AIDS policy that preserves recently achieved mortality reductions while lowering the annual number of new infections to less than the annual number of AIDS deaths. Sustainable progress can be made by donors specifying commitments to support existing ART patients, as well as a percentage (reduced from current levels) of those newly needing treatment. This will allow all stakeholders to plan for the future and for countries to decide how much additional treatment to finance themselves. In addition, donors could maintain the current treatment threshold of 200 CD4 cells/ μ l; integrate treatment within existing health systems; use incentives (e.g., cash or food) to raise adherence to treatment; and aggressively cut the cost of providing ARTs and of administration and technical assistance from outside the developing world.

Prevention efforts must be boosted to more than compensate for any increased transmission due to scaling back of the growth of ART access, in part by improving the monitoring of epidemic trends, rewarding countries for improvements (19, 20), and making evidence of effective prevention a condition for continuing support of

treatment. A range of prevention strategies is available (1, 20, 21). A recent review concludes that efforts to circumcise males and reduce the number of people who have sex with multiple partners appear to be particularly effective (21). Finally, donors must protect and expand resources for the most cost-effective health interventions, focusing on HIV prevention, childhood immunization, malaria, tuberculosis, maternal mortality, and family planning. These efforts will improve global health for a few dollars per year of life saved, instead of postponing deaths at hundreds of dollars per year saved with ARTs.

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