Allocating HIV-Prevention Resources: Balancing Efficiency and Equity

The primary goal of HIV prevention is to prevent as many infections as possible. This requires allocating HIV-prevention resources according to cost-effectiveness principles: those activities that prevent more infections per dollar are favored over those that prevent fewer. This is not current practice in the United States, where prevention resources from the federal government to the states flow in proportion to reported AIDS cases.

Although such allocations might be considered equitable, more infections could be prevented for the same expenditures were cost-effectiveness principles invoked. The downside of pure cost-effective allocations is that they violate common norms of equity. In this article, we argue for a middle ground that promotes both equity and efficiency in allocating federal HIV-prevention resources. (*Am J Public Health.* 2002;92:1905–1907)

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WHAT IS THE PRIMARY GOAL of HIV prevention? The obvious answer is, To prevent new HIV infections. What then should be the primary objective of a national HIV-prevention strategy? As argued in the recent Institute of Medicine (IOM) report[1]: to prevent as many new HIV infections as possible with the resources available for HIV prevention. How can this goal be achieved? By allocating HIV-prevention resources to those activities that are most cost-effective.

Many view the allocation of HIV-prevention resources principally as a political issue. Community-based organizations, advocacy groups, state health departments, and other stakeholders clamor for their fair share of the federal HIV-prevention pie. Indeed, the existing federal allocation processes (for example, HIV-prevention community planning) and funding outcomes (for example, funding proportional to AIDS cases) are consistent with the view that fair division, and not cost-effectiveness, is the predominant concern in allocating HIV-prevention resources.

We do not deny that equity and fairness are important considerations that must be factored into any resource allocation process. However, it is not often realized that the choices of which, and at what levels, HIV interventions will be funded have important consequences for the overall success of the national HIV-prevention effort. Changing the way that available HIV-prevention dollars are allocated across different activities can have an even greater impact than increasing the overall level of spending on prevention. Viewed in this light, it is clear that the nation pays a price—measured in infections that could be averted but are not—for maintaining our current approach to resource allocation for HIV prevention.

PROPORTIONAL ALLOCATION AND EQUITY

The recent IOM study highlights this problem. For example, in considering the allocation of federal HIV-prevention community planning dollars, the IOM committee noted that Centers for Disease Control and Prevention (CDC) funds are disbursed across the states in proportion to newly reported AIDS cases (as shown in Figure 1 for fiscal year 1997). In the figure, each point corresponds to a different state. For each order-of-magnitude increase in the number of newly reported AIDS cases, there is a corresponding order-of-magnitude increase in the amount of prevention funds awarded.

We recognize that this pattern is more the result of history and various congressional directives than of a centralized, coherent plan for allocating HIV-prevention resources. Nonetheless, proportionality *does* characterize the flow of federal HIV-prevention funds to the states. For this reason, it is important to evaluate the impact of the resulting resource allocations.

Some would argue that proportional allocation is fair, in that HIV-prevention dollars awarded per AIDS case are roughly the same across the states. We would argue, however, that state health departments should be rewarded for *preventing* new HIV infections

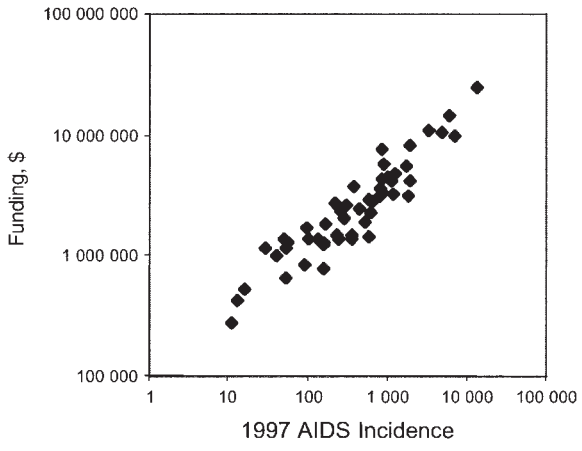

FIGURE 1—Centers for Disease Control and Prevention (CDC)–allocated HIV-prevention community planning funds vs AIDS incidence by state (fiscal year 1997).

as opposed to *reporting* AIDS cases. Perversely, under proportional allocation, state health departments fielding successful interventions that lead to reductions in HIV infections—and, ultimately, in AIDS cases—would lose funds, while health departments with ineffective programs that lead to the continued spread of HIV and AIDS would gain resources.

There are other objections to this proportional allocation pattern. For one example, AIDS cases are the result of past infections, while new infections can be prevented in the future—this renders AIDS case reports a questionable index for allocating prevention dollars. More problematic, however, is the fact that the existing approach ignores the differential cost-effectiveness of competing HIV-prevention interventions. Since the number of infections that can be averted is the product of the HIV incidence rate absent intervention and the fraction of new infections that can be prevented at a given expenditure level, ignoring the cost-effectiveness of prevention activities when allocating resources is untenable.

COST-EFFECTIVE ALLOCATION AND EFFICIENCY

The objection here is not merely academic. Incorporating cost-effectiveness into the federal-to-state resource allocation process can make a real difference. (While existing CDC guidelines promote consideration of cost-effectiveness at the state and local level, no such guidance addresses federal–state flows where the potential impact of cost-effectiveness is much greater.) The IOM report makes this clear via a detailed modeling study that estimates the number of new HIV infections that could be prevented in the United States as a function of alternative funding allocation strategies. At the core of the model is the simple aforementioned identity: Infections Prevented=New Infections × Fraction Prevented. This identity conveniently breaks the problem of estimating infections prevented into 2 complementary activities. Estimating the rate of new infections is a problem in HIV epidemiology, while estimating the fraction of infections that can be prevented as a function of investment derives from program evaluations. The IOM report addressed both inputs to this equation.

Rather than attempt to model HIV incidence rates directly, the committee employed 1996 estimates of annual new HIV infection rates in 3 risk groups—men who have sex with men, drug injectors, and heterosexuals at high risk—in each of the 96 metropolitan statistical areas in the United States with populations over 500 000.[2] Despite the imperfections of these estimates,[3] they were (and remain) the only figures sufficiently disaggregated for examining the implications of resource allocation patterns such as that shown in Figure 1.

To estimate the effectiveness of HIV intervention programs serving the 3 risk groups identified above, the committee reviewed the HIV-prevention literature. HIV interventions for each group were characterized initially by 2 key measures: the average cost per program participant and the percentage reduction in HIV incidence that could be expected among program participants. From this review, the committee developed 3 scenarios—base case, optimistic, and pessimistic—for each risk group. The base-case scenario reflected average program effectiveness in reducing the rate of new infections and average costs per program participant. The optimistic scenario combined above-average program effectiveness with below-average costs, while the pessimistic scenario combined below-average effectiveness with above-average costs. In addition to cost and effectiveness measures, the committee noted that most HIV-prevention studies report at least some degree of client dropout; at times, these rates are appreciably high. This led the committee to impose constraints restricting the maximum fraction of the population at risk that could be retained by HIV interventions irrespective of expenditures. These constraints were set to 25%, 50%, and 75% for the pessimistic, base-case, and optimistic scenarios, respectively.

The resulting model took the form of a linear program (the mathematical details appear in Appendix D of the IOM report[1]). As a function of the HIV-prevention budget, the model suggests the amount of money to allocate to prevention programs serving different risk groups in different states to prevent as many new infections as possible. The committee also estimated, as a function of the budget, the effectiveness of proportional allocation in preventing infections. The analysis suggested that at current budget levels (the CDC spent roughly $412 million in 1999 on HIV-prevention interventions as detailed in Appendix C of the IOM report[1]), the estimated annual number of infections prevented by federally sponsored interventions could be increased by at least 30% beyond what is achieved with proportional allocation. The price paid for adhering to proportional allocation thus equals this 30% improvement, which translates to 900 infections annually in the IOM example. To achieve this same 30% increase in effectiveness with proportional allocation would require increasing the prevention intervention budget from $412 million to more than $700 million, which is another way of viewing the inefficiency of the current approach. Cost-effective allocation retained at least a 30% edge compared with proportional allocation for annual budgets of $500 million or less in both the base-case and pessimistic scenarios.

BALANCING EFFICIENCY AND EQUITY

While the advantage of reallocating funds in accord with the principles of cost-effectiveness is clear from the results reported above, such an approach would venture far from common norms regarding equity and fairness. Cost-effective allocations proceed by allocating funds from the most effective combinations of programs and populations to the least until the money runs out. In the process, some populations would be left without any prevention services. For example, interventions for groups that are particularly difficult to reach require greater investments to locate persons at risk, let alone to successfully intervene. This translates into a greater expense per infection averted in such populations, making investment in prevention relatively unattractive from the standpoint of cost-effectiveness. Yet there is something troubling about the notion of preventing only "easy" infections and doing nothing for those too difficult to reach.

What we are faced with is a tradeoff between efficiency and equity in HIV prevention. Propor-

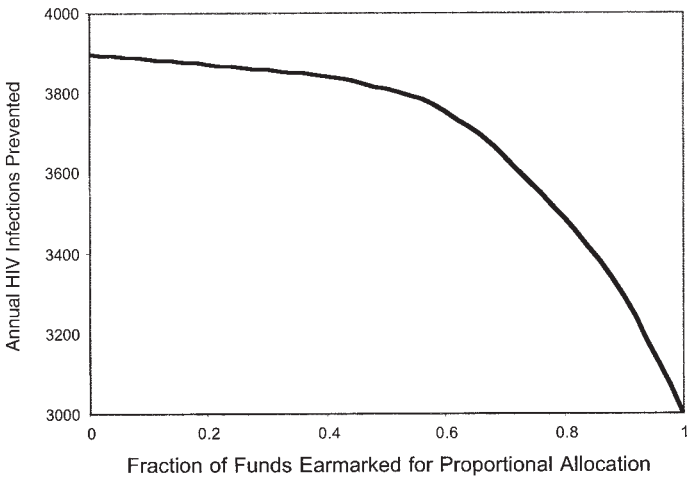

FIGURE 2—Number of HIV infections prevented annually: base-case model, $412 million budget.

tional allocation represents the equity extreme of this tradeoff, whereby cost-effectiveness is completely ignored. Cost-effective allocation represents the efficiency extreme, whereby equity receives no weight. We propose here an intermediate solution that promotes the best features of both approaches and enables one to view the equity–efficiency tradeoff inherent in this resource allocation problem.

Our proposal is that all risk groups currently receiving federally funded intervention services continue to do so through the proportional allocation of some fraction of the total budget in accordance with current practice. This fraction would be *earmarked* for proportional allocation. The remaining funds, which we term *discretionary*, would be allocated in accordance with the principles of cost-effectiveness.

The performance of this proposal is illustrated in Figure 2, which was derived from the same base-case model and data employed in the IOM report. The vertical axis reports the estimated number of HIV infections averted annually by federally sponsored prevention activities. The horizontal axis reports the fraction of the $412 million prevention budget that is earmarked for proportional allocation. The curve thus illustrates the decline in the annual number of HIV infections prevented as the amount of funds earmarked for proportional allocation increases.

When all funds are earmarked, we obtain the IOM estimate that 3000 infections are prevented annually under proportional allocation. When no funds are earmarked (and hence all funds are allocated in accord with cost-effectiveness principles), we obtain the IOM estimate that 3900 infections could be prevented annually. Most important, only a partial retreat from proportionality is required to generate most of the benefits offered by cost-effectiveness. The number of infections averted stays relatively flat provided that the fraction of funds earmarked for proportional allocation remains below 60%. Indeed, setting aside 60% of the prevention funds for proportional allocation while allocating the remaining 40% in accordance with cost-effectiveness principles would result in about five sixths of the gain in averted infections that is obtained by complete reliance on cost-effectiveness. As long as those activities that prevent the most infections per dollar are fully funded, deviations from the strict cost-effective ordering of intervention–population combinations to achieve accepted minimum funding for all risk groups would prevent almost as many infections as a purely cost-effective allocation. It is therefore possible to achieve most of the gains available from better targeting of prevention resources while still satisfying the ethical concerns of equity and fairness.

The IOM committee stated, and we concur, that allocation decisions regarding HIV-prevention resources represent the single most important set of HIV-prevention decisions made. We believe that it is possible to prevent more infections while preserving an acceptable degree of equity and fairness in allocation outcomes. Perhaps more important is that all concerned with HIV-prevention policy recognize the centrality of resource allocation in HIV-prevention policy. Resource allocation is not simply an argument for how to divide the pie; some allocations are arguably better than others. We encourage analysis, debate, and discussion with the hope of converging on federal and state allocation plans that are both effective and fair. ■

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