

Part Three:

Resource Allocation

Resource Allocation; Issues and Conclusions

Give a man a fish, and he will eat for a day. Teach him how to fish, and he will eat **for** the rest of his life.

—*Chinese proverb*

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Resource Allocation; Issues and Conclusions*

The previous chapters have sought to make two critical points: that the development and use of technologies for disabled persons are greatly affected by available resources, and that, in turn the efficient and effective allocation of resources depends on an appreciation of the powerful role played by technological capabilities and limitations. Efforts to improve resource allocation must take into account the controls and incentives cur-

rently operating on the development, evaluation, diffusion, and use of technologies.

This chapter focuses on the allocation of resources. It briefly mentions the historical and current forces that have shaped patterns of resource allocation, presents conclusions relating to several key policy issues, and then discusses a method for structuring decisions.

PATTERNS AND FORCES IN RESOURCE ALLOCATION

Current public policy toward disabled persons has evolved over the last several decades in complex and unpredictable ways. At bottom, however, the process of policy formation in this area can be viewed as a long series of decisions concerning the allocation of resources to and among disabled individuals in our society. Frequently, these resource allocation decisions are expressed in laws and regulations governing who should receive what kind of assistance. For the most part, these decisions have been made by nondisabled people, often with little or no input from disabled people. Income subsidies, medical treatment, vocational therapy, affirmative action, special education, and other social services are examples of the kinds of assistance proffered. Such assistance constitutes the resources potentially available to disabled individuals. Which individuals actually receive particular resources is the essence of the allocation *decisions* determined by statutes, program regulations, definitions of disability, need standards, and the like. Both the *resources* available and the allocation decisions are means to accomplish a given purpose intended by a decision-maker.

In the 19th century, the United States was a rapidly expanding country with an unlimited frontier and a predominantly agricultural economy. The virtually unrestricted opportunities offered by a rapidly growing population, an abundance of rich natural resources, and vast areas of available land helped mold the American tradition that through hard work, initiative, and thrift, each individual should provide for his own needs and the needs of his family. For those individuals incapable of this, the community and philanthropic institutions provided assistance. What little the State governments did involved custodial care of "the poor," "the orphaned," and "the disabled" in asylums. Toward the close of the 19th century, the industrial revolution altered the economy and changed this society forever.

Economic development, labor specialization, and urbanization shifted this country from a predominantly land-based, rural, individualistic society to a highly industrialized and interdependent one whose people depended on a continuing flow of wage income to provide economic security. The extended family and the tightly knit community it fostered largely passed out of existence. Informal structures such as families, community, and philanthropic institutions became incapable of dealing effectively with the problem of economic need and dependency.

*Parts of this chapter are based on material prepared for OTA by Tom Joe, Cheryl Rogers, and John Nelson of the Center for the Study of Social Policy, University of Chicago, and by Mark Ozer of the George Washington School of Medicine.

The responsibility for those with special dependency problems gradually passed, in substantial part, to government. In the 20th century, government efforts, largely at the State level, were directed at providing cash relief to various categories of "the poor," "the orphaned," and "the disabled" in their own homes. By the 1920's, a growing number of States created programs to assist elderly and disabled individuals.

This period also marked the emergence of pension plans for several categories of workers to provide economic security in old age and retirement systems for certain groups of Government employees. The Federal Government also accepted responsibility for providing benefits and services for World War I veterans. States also enacted the first workers compensation programs.

The inadequacy of these early government efforts to deal with the problem of economic security became dramatically evident during the great depression of the 1930's. All of the previous State government mechanisms for mitigating the economic hardships of unemployment, old age, and the breadwinner's death or disability proved totally inadequate in the face of a national economic disaster. In the New Deal era, Federal programs were enacted to meet the economic needs of the population. In the 1960's, Congress authorized a vast array of new Federal programs and expanded the old ones to provide for the needs of elderly, poor, unemployed, and disabled people and children.

The development of Federal programs and expenditures for disabled people was thus an outgrowth of a larger movement in government—particularly at the Federal level—that required increasing responsibility for insuring economic security to the Nation. Indeed, within this movement, income maintenance provisions for disabled people came relatively late. While concern for rehabilitation had been expressed in the 1920's, leading to Federal funding of vocational rehabilitation services in education grants, it was not until the 1950's that major attention was focused on income support for disabled people as a separate group. The sole exception was blind persons.

The two largest income support programs for disabled people became law in the 1950s: Aid to

the Permanently and Totally Disabled (APTD) in 1950; and Social Security Disability Insurance (SSDI) in 1956, which has already been discussed. APTD arose largely because efforts to expand and systemize the welfare programs of the New Deal encountered political opposition in Congress. In the face of this political inertia, proponents of aid (to "the needy handicapped") as part of a comprehensive assistance program were forced to enact a new program specifically designed for this group. Resource allocation on the basis of need (means tested) was to be categorical. States were not required to participate in the program. The Federal matching grant formula was complicated, and definitions of eligibility varied from State to State.

The Great Society programs of the mid-1960's vastly expanded the resources allocated to disabled people—e. g., Congress created the Medicare and Medicaid programs. Originally intended as a health insurance program for short-term illnesses among elderly people, Medicare became a major source of funds for disabled individuals.

The non-Social Security needy population—disabled people in need of assistance and others—was served by Medicaid, which quickly became a mainstay of medical assistance to disabled people outside the Social Security system.

The final block in the Federal income maintenance and medical care structure for disabled people was the Supplemental Security Income (SSI) program, as described in chapter 9.

Throughout this period, all social services available to "needy" persons, including those with disabilities, expanded. Vocational rehabilitation agencies extended services to all disabled individuals and began rehabilitation programs specifically for SSDI and SSI beneficiaries. In 1975, title XX of the Social Security Act provided block grants to States for social services.

Although they represent the largest expenditures for disabled people, the four major Federal programs in place by the mid-1970's were outgrowths of resource allocation decisions directed principally toward elderly people. Disabled people were included when it was recognized that their needs were unmet by existing program struc-

tures. With the exception of rehabilitation services, the social service programs also regarded disabled people as merely one of many needy groups. There is, however, another historical movement that arose during this period—that of disabled people themselves asserting their rights.

During the 1960's, attitudes toward disabled people began to change. First, media attention incited public outrage at unnecessary and careless incarceration of disabled individuals in institutions. Court cases and litigation documented widespread abuse of institutionalized persons. As an outgrowth of this protest, disabled persons and their advocates began to question the resource allocation decisions that affected their lives. They demanded greater personal autonomy in these decisions. This questioning spawned the independent living movement, the consumer involvement movement, and the drive to gain legal rights for disabled people. At the heart of the independent living movement is the idea of exercising control over one's life.

The deinstitutionalization movement also stemmed from this widespread criticism of institutions. Those disabled by mental impairments were released from large sterile institutions so they could be served in smaller community-based facilities. This change was in large part one of resource allocation. Moneys spent on institutions were shifted to community facilities in response to the demands of disabled people. With the passage of Medicaid, States began a massive shift from using only their own State moneys to relying largely on Federal funds for skilled nursing and intermediate-care facilities. Through the independent living movement and reinstitutionalization, it became apparent that disabled individ-

uals were capable of assuming far greater responsibilities for their lives and the public resources devoted to them than previously imagined.

Disabled people also began to assert their civil rights to protest denials of access to public facilities and to shed the stigma and stereotypes so long attached to them. In the 1970's, disabled people began demanding—not unlike the civil rights movement of the 1960's—a reallocation of public resources to facilitate their integration into the mainstream of society.

The disability rights movement produced a new type of resource allocation decision unrelated to the traditional areas of income maintenance, rehabilitation, and custodial care: affirmative action and nondiscrimination laws. Rather than allocating Federal resources, Congress created statutes that mandated the allocation of State, local, and private resources to facilitate the "mainstreaming" of disabled individuals.

The Federal resources involved in implementing such statutes are small compared to those for income maintenance and social service programs. The social cost of this type of allocation decision, however, can be very high. It is, perhaps, the most direct method of allocating resources in accord with the desires of disabled people. It can also be the most burdensome to the rest of society. When linked with fiscal pressures to stem the rising costs of traditional programs for disabled persons, this type of allocation method can contribute to the resource allocation dilemma that today's policymakers confront: how to achieve effective allocation to match increasing needs and demands while faced with declining resource availability.

RESOURCE ALLOCATION DECISIONS

There are two extremely important background points to be made in regard to the issue of technology and resource allocation. First, all decisions concerning the development and use of technologies for disabled persons are either directly or indirectly resource allocation decisions. This state-

ment follows from the general observation that all decisions under circumstances of scarce resources are ones of resource allocation. An example of a direct resource allocation decision would be legislation requiring that all new phone handsets be compatible with the induction setting

of hearing aids. * There would also be indirect resource implications of any such legislation. An example of a decision where the indirect impact on resource allocation would be the critical factor might be legislation appropriating substantial funds for a program to develop methods for restructuring jobs and job sites for disabled persons. The direct appropriation for such a program would possibly be small in comparison to the resource implications brought about by the increased numbers of disabled people who could be employed and thus earning a wage, paying taxes, leaving public income maintenance programs, and so on.

The second background point is that nearly all *resource allocation decisions involve a compromise*. There is rarely an obvious choice to be made that every relevant party agrees with and supports. Social, economic, technical, and political considerations must be considered as a mixture of applicable variables. This situation implies that *analysis, especially quantitative analysis, can rarely if ever play the determining role in a policy decision*. Interestingly, this situation also implies that analysis can play an important role: Because there are so many different types of variables to be considered in a resource allocation decision, and because the indirect and often unintended impacts of such a decision can be so important, methods of structuring decisions and forcing explicit consideration of the range of relevant factors are desirable. Analytical techniques will be discussed in a later section of this chapter.

Resource allocation decisions can be as complicated as they are pervasive. There are several ways to characterize them. One is by the level of the decision. It can be a societal-level decision, a program decision, an institutional one, or an individual decision. Another way to distinguish between types of allocation decisions is by whether they are directly *allocation* decisions or whether they are primarily direct *spending* deci-

● Most hearing aids have a "telephone" or "induction" setting that allows the aid to pick up the electromagnetic signal produced by most telephone handsets. However, it is estimated that at least 35 million of the 170 million telephones in the United States do not produce an electromagnetic signal that produces compatibility with hearing aids. Hearing-impaired people are thus denied the use of those telephones. Ironically, many of the incompatible sets are located in hospitals,

sions that affect allocation only indirectly. A third way of characterizing these decisions is by the principal substantive areas they address. For example, a decision may be primarily, or directly, oriented to allocating transportation resources.

Levels of Decisionmaking

The importance of distinguishing between various levels of decisionmaking lies in the differing scope of costs and outcomes to be considered, the differing analytical tools available, and the differing parties at interest whose views and desires could be taken into account.

The types of decision variables do not change very much between levels, but their relative importance does. Table 9 shows the type of decision variables that might be considered in any allocation decision. Legal considerations, for example, still play a role but are less important at the individual level. The reverse is true for psychological aspects of a decision. The costs and benefits of any decision follow from the variables listed. Thus, the relative importance of various types of costs or benefits changes depending on the level of decisionmaking.

Allocation Versus Spending

Strictly speaking, a resource allocation decision should be one where a set amount of resources is distributed among programs, people, goals, or some other division of possible recipients. This

Table 9.—Comparison of Decision Levels and Decision Variables

| Decision variables | Level of decision | | | |
|------------------------------------------------------|-------------------|---------|---------------|------------|
| | Societal | Program | Institutional | Individual |
| Technical. | A | A | A | A |
| Personal gains and biases of decisionmaker | C/B | B | B/A | A |
| Social | | A | B | B |
| Psychological | c | C | B/A | A |
| Legal | A | A | B | C |
| Economic | A | A | A | |
| Political | A | A | A | C |
| Ethical | A | B | B | B |

A Critical variable
B Moderate variable
C Marginal variable

SOURCE Office of Technology Assessment

type of *resource* allocation is direct. It may have a substantial amount of visibility—as when the Congress allocates the budget between human services and other areas—or may be a more private one—as when a disabled individual decides how to divide a fixed amount of income among competing uses, or a medical devices company allocates its resources between research and development (R&D), sales, production, etc.

A more complicated allocation decision is one in which no direct distribution among competing uses appears to take place. Seemingly, only a spending decision is made. A person decides to buy a power wheelchair, for example. Or the Veterans Administration (VA) decides to include a technology in its package of services. Such decisions may appear to be relatively straightforward questions of expenditures. However, they may involve other, sometimes more important, questions. They may turn out to be allocation decisions in two ways. First, any decision to spend money from a limited budget reduces the amount of funds remaining. Money has been in effect denied to all other possible competing uses. Second, a decision may lead to further nondiscre-

tionary expenditures, further reducing remaining funds. A power wheelchair, for example, may require more maintenance expenses, battery costs, etc. In effect, money has been allocated without the opportunity to explicitly compare the alternative uses for those funds.

Substantive Area of Decisions

This way of characterizing decisions is important because of the nature of decisions and decisionmakers. Many decisionmakers tend to think in categorical, programmatic, or subject-area terms. Medicare officials, for example, make decisions in relation to the effects on the Medicare program and, perhaps secondarily, on the Medicare constituents. This orientation is natural, but, more importantly, it is reinforced by the organization of programs and responsibilities. The number and size of programs and services for disabled people create the conditions for thinking and administering in a relatively narrow manner, and yet at the same time they demand, ideally, a more comprehensive decision orientation. This is especially true at the Federal level.

CURRENT ISSUES IN RESOURCE ALLOCATION

This section includes discussions of several issues related to resource allocation. The issues covered are not the only ones that exist. There are others that are also quite important. “Competition” between programs for mental health, mental disability, and physical disability as an issue of competing values in society is one example. Another is the issue of how best to allocate funds for maternal and child health programs in order to prevent or ameliorate disabilities. Thus, the issues below are meant to illustrate the types of issues that are faced by those people involved in disability policy and programs.

Eligibility Determinations and the Definition of Disability and Handicap

At present, most resource allocation decisions focus attention on the individual and the disability instead of the context—the social and physical en-

vironments of the individual. For example, in recent debates about the increasing costs of disability, a great deal of attention has been focused on the question of why more and more people are claiming disability, but little attention has been given to the economic situation that may force people with various disabilities out of the work force because their abilities are no longer needed. Solutions to date have largely included intensifying the evidentiary rules for establishing disability, rather than examining what can be done to modify the situation to provide greater opportunities for disabled individuals. The easier course has been to make a particular program’s definition of eligibility more restrictive, rather than to reallocate resources in a manner that will allow the abilities of an individual to find productive expression.

The present tendency to define individuals in terms of medical categories fails to take into ac-

count wide variations in individual performance due to differences in motivation, native strengths and weaknesses, available technologies, and environment. Many people in the field have long felt that a more useful definition of disability would be based on individuals' functional performance—i.e., upon their abilities. A functional definition of (disability provides a broader view of the individual in his or her environment. It is also crucial to keep in mind the dynamic nature of both abilities and disabilities. They change over time, Services and policies must not be based on a concept of disabilities as static. Resource allocation decisions based on this definition could systematically take into account personal adaptations to the underlying condition; available environmental and technological supports; changes over time in age, attitude, and motivation; and a variety of possible roles that might be filled in a given profession. The focus is then on the circumstances and not the underlying condition.

A disability is currently defined by various medically significant, mental and/or physical conditions. *Categorization based solely on these medical labels reflects a focus almost exclusively on the inability rather than ability.* Often this thinking results in resource allocation decisions that preclude opportunities. Compensatory abilities are neglected, and the (in part thereby) handicapped person may become segregated, frustrated, and economically dependent. Such definitions tend to create the handicap out of the disability. They may skew resource allocations in ineffective directions.

One of the most promising comprehensive definitions is offered by Saad Nagi, * although he uses the term "disability" instead of "handicap," which OTA has chosen.

. . . . disability is a form of inability or limitation in performing roles and tasks expected of an individual within a social environment. These tasks and roles are organized in spheres of life activities involved in self-care, education . . . , interpersonal relations, recreation, economic life, and employment or vocational concerns . . .

* S. Z. Nagi, "Criteria for Evaluating Disability, Eligibility for Benefits and Needs for Services" (unpublished paper), Ohio State University, 1976.

Thus, disabled persons are those who are limited in their ability to perform certain daily activities. Every disabled individual is, by definition, limited to some extent and therefore will fall along a continuum according to the extent of that limitation. Although one person may have a more severe limitation than another, each requires assistance to overcome or compensate for his or her particular limitations. The focus can then be shifted from the disability per se to what resources an individual requires to overcome the disability and enhance his or her abilities,

If a handicap is viewed as the combination of a disability and other environmental factors, and given that a specific disability does not preclude the existence of other abilities, then the means of alleviating the problems posed by the handicap become quite different. *With a presumption of both disability and ability, the resource allocation decision becomes a task of altering the environment in order to maximize the individual's abilities to perform at levels comparable to the nonhandicapped.* In that event, "nonhandicapped" would include both disabled and nondisabled persons.

The policymaker might use this framework for understanding the context of disability to make more effective resource allocation decisions to accommodate disabled persons. Resources can be allocated to enhance employment and independent living opportunities as well as other programs that seek to maximize the abilities of individuals. The policymaker can also use this framework to allocate resources to modify the physical environment of the disabled person, since it is often the environment that inhibits typical function. One of the most effective ways of doing this is to develop technologies that can assist disabled persons in performing ordinary daily activities.

The voice-controlled wheelchair, for example, uses a voice-command computer to enable a paralyzed person to move about. It also operates an environmental control system installed in an office or home that will open the door, turn on the lights, change television or radio stations, dial a telephone number, operate a page turner, or run a tape recorder on command. The voice-controlled wheelchair can accommodate any language

—even patterns of sounds by persons who cannot vocalize in a language. The allocation of resources for similar independence and ability enhancing technologies should be a prime goal of public policies toward disability.

Development of new technologies is only one example of the directions in resource allocation that policy makers could take if they used comprehensive approaches to the concept of disability. An important effect of such approaches would be to convey to policy makers an understanding that resource allocation decisions must be based on abilities as well as disabilities.

Categorical Orientation of Allocation

A large number of separate constituencies have been supportive of their various program areas and have come into existence as a result of the present organizational structure of programs for disabled people. Despite these factors, there has been considerable movement already towards commonality. One major issue to be considered is the degree to which generic programs, as opposed to ones organized by categories of disability, should be encouraged.

A major step toward integration has occurred in the change in the traditional thrust of rehabilitation services for adults from that of merely employment toward a broader range of goals by including severely disabled individuals in that program area. The developmental disabilities program area, in relating to the most severely disabled individuals, extends its principal services beyond the more traditional school age and educational aspects to those required over the entire life of the individual, including work roles. One other possible need, however, is a greater orientation toward vocational goals at an earlier age. There is at present a discontinuity between educational programs for disabled children and vocational programs.

Reorganization of a generic program for disabled persons could reflect the model already in existence for developmental disabilities, which crosses age boundaries and boundaries of education and work sites. An alternative generic program may continue to recognize age boundaries

in terms of delivery of services within the educational system versus outside the system, but some greater integration would be desirable.

The crucial policy issue in any alternative generic program is that of the degree of severity of the problem to be addressed (e.g., the lessening of the effects of disability) and the allocation of Federal funds. An ad hoc decision has already been made in the budgetary process wherein funds are differentially provided to these various program areas. Federal support for educational programs for disabled children, in the range of \$1 billion, is roughly comparable to the support provided for rehabilitation; the support for developmental disabilities is in the range of \$50 million. Support for education has been mainly provided at the local and State level, with the Federal contribution relatively small and considered supplemental. Federal support for vocational rehabilitation has been a traditionally larger contribution. A major issue currently is the allocation of funds for those individuals who are most severely disabled (for whom funds have not traditionally been made available by the States and localities). A generic program for disabled persons may be organized around the issue of degree of support required rather than existing categories and would make even more critical the need for decisions at the congressional level as to priorities.

Within each of the existing program areas, a similar issue arises when categorical aspects are considered. Considerable movement has already occurred within each of the program areas toward more functional descriptions of those to be considered eligible for services. Although the principle of "impairment" based on medical conditions or diagnostic categories remains, there has been some lessening of its use, particularly in the area of developmental disabilities.

One issue to be resolved, or at least considered, is an organization of services to disabled children that would be based on the degree of severity of the disability rather than on any medical or other category. A cost sharing principle has been in existence for some time in the relationship between the Federal interest and the interest of the States and localities for the increased costs for disabled children. A Federal policy issue is what the dis-

tribution of Federal resources should be at different levels of intensity of services. Debate may then focus on the formula for allocation of Federal funds. Some elements in such a review would include methods for the encouragement of integration of disabled children into the mainstream of education and a continued Federal interest in protecting the most severely disabled individuals, as well as the differential costs of various service levels.

A movement toward generic (noncategorical) programs based on the intensity of services required could reduce the amount of inappropriate categorization of individuals in terms of impairments (or diagnostic categories). The focus of such a determination could shift attention from the services provided directly to a specific child to broader programmatic support that would help all children requiring such services within the educational system.

No matter what area of Federal policy is involved—education, vocational rehabilitation, health care, social services, housing, etc.—allocation by program and by geographic or population basis is hampered by the state of data available on the types, amounts, and results of current services and other technologies being delivered and planned for. Current management information systems, as discussed in chapter 3, are not oriented to providing individuals, State governments, or the Federal Government with adequate, functionally based information.

Issues of Resource Allocation and Independent Living

One of the primary directions of the independent living movement is the participation of disabled persons in making decisions about themselves. The implementation of this potentially far-reaching concept has been relatively slow. None of the management information systems in existence or projected in the near future will collect data as to the actual level of participation of the clients. Doing so might help to make the goal of independence more feasible in itself. The issue to be considered is the degree to which it is a Federal resource allocation priority to encourage consumer participation and independent living.

Another goal of the independent living movement concerns the locus of the problem. If, as traditionally thought, the problem is sited in the client, resources are allocated for training and other programs to make the client better able to interact with a given environment. However, if the problem is also in the environment, as mentioned previously, then resources might be differently allocated. A portion of the funds might be allocated for changes in the physical environment for individual persons or for groups. Funds might be allocated preferentially for the development and maintenance of devices that would permit more effective interaction with the environment.

The third issue that arises as a result of the independent living movement is the degree to which the process of rehabilitation can be carried out in independent living centers under the control of disabled persons rather than through more traditional, professionally controlled programs. There may be a potential for less costly and more effective services via this innovation. The significance of this alternative mode of service delivery has been noted in the existing Rehabilitation Act but funded to only a very limited degree. Once again, a decision to encourage such activities would be translated into the percentage of the total budget devoted either directly by the Federal level or by an earmarked component of those funds delegated to the States. The Federal interest in early support for demonstration of effectiveness of innovative alternatives may be seen as a priority which States and localities are generally less likely to support.

Outcome Measures Used in Resource Allocation

The measures of outcome or effectiveness of Federal programs for disabled people are numerous and have changed over the years. "Productivity," however, is still one of the primary outcomes sought. The measure of productivity has been expanded recently beyond earnings in employment to recognize the contributions to productivity made by homemakers and to the community by unpaid volunteers. This measure, however expanded, remains one of the basic measures of outcome.

Another outcome sought by more recent allocation decisions is the degree to which the individual is able to function in the “least restrictive” environment. Like the principle of productivity, this outcome relates to independence and to the degree of support by others. It is important to recognize that less restrictive environments are frequently, but not always, ones in which costs are lessened. The so-called “deinstitutionalization” movement has sought, with some public support of community-based services, to increase the likelihood of disabled persons living independently in their own homes or in group homes. Both the expansion of the principle of productivity outcomes to other than gainful employment and the expansion of the range of options for support for living independently are relatively new concepts expressed in the most recent law.

Underlying these new concepts has been another outcome widely sought by disabled persons themselves: self-determination. This goal is expressed in public policy in the requirement for client participation in the creation of individualized rehabilitation or educational plans. Self-determination implies independence and individual initiative. It is having more control over one’s own life than has typically been the case for many disabled people due to the amount of control exercised by physicians and other professionals.

The outcomes may be mutually supportive and should be considered together when allocating resources. Self-determination in terms of clients’ participation in planning for themselves is in itself a major outcome and is likely to enhance the other outcomes of productivity and community living. Involvement in the planning process would include not only participation in setting goals, but also contributing to the identification and development of the means by which problems are to be solved and goals reached.

The management and administrative skills necessary for “producing” such a blend of outcomes may be somewhat different from those in the “production” of a job placement. One idea to be considered is the use of a management system appropriate for the development of new technology and ideas—the management of an R&D firm rather than an auto factory. The principle is that of

resource development rather than simply allocation. Such an approach is highly compatible with, for example, the professional goals of a rehabilitation counselor. However, its actual implementation could require meticulous attention to the attaining of goals through the participation of disabled persons to a much greater degree than at present. This idea is one of the tenets of the independent living movement. The recent funding of programs under title VII of the existing Vocational Rehabilitation Act provides an opportunity for assessing the cost effectiveness of services being provided in this more participatory manner.

Prevention of Impairments and Disabilities

Although prevention is the theoretical ideal, and despite many significant success stories (e. g., polio vaccine), the goal of prevention remains unfulfilled due to a combination of inadequate knowledge, human nature, and finite resources.

Even if resources were unconstrained, it would be difficult to prevent diseases and other disabling conditions whose causes are unknown or for which no effective preventive technologies can be devised with current knowledge. This knowledge constraint underscores one of the aspects of “resource capability:” Resource capability refers not just to the *amount* of resources available but also to the degree of *ability* to use them. Thus, the country cannot spend money administering a vaccine that does not exist, just as it cannot effectively spend money persuading people of the risks associated with various behaviors if the knowledge of effective information transfer techniques does not exist. A critical issue of resource allocation related to prevention is what share of its resources a society allocates not just to prevention but also to the search for the ability to prevent disabilities. Basic research on motor function, tissue structure and regeneration, molecular genetics, enzyme function, and cell biology in general are examples of promising areas of basic research. Just as important, however, is research on the development and engineering of technologies that have been made possible through basic research. Similarly, research is needed in services delivery (e.g., how can vaccines be most effectively de-

livered), in policy and programs (e.g., how can prevention programs be most effectively and efficiently administered), and in demographics and epidemiology (e.g., who is at risk; how can such individuals be identified in advance?).

In discussions of prevention, human nature is sometimes termed "imperfect" or "self-defeating" because humans do not always seem to act in their own, safe, rational best interest. Although the philosophical dimensions of the attitudes behind the use of such terms are not the subject here, it should be noted that seemingly irrational, risk-taking behavior is not necessarily "imperfect" or

Improper." It maybe a reflection of different individuals placing different values on risk-taking, risk-aversion, probability of negative outcomes, and the meaning of possible outcomes. Whatever the human motives involved, policies toward prevention must take human nature into account. The success of a public health campaign of immunization against childhood diseases, for example, is very much dependent on the willingness of parents and children to comply, to take the vaccine. This may require informing the relevant population of risks and benefits of vaccination; it may require the establishment of various sanctions for failure to comply. Public policy must address a range of attitudes before resources can be successfully devoted to prevention. "Seat belts are inconvenient and uncomfortable." "I like to smoke." Statements such as this may seem mundane and obvious, but the attitudes behind them often reflect strongly held feelings of personal freedom and determination. They must be considered in the allocation of resources for prevention.

This leads to another issue of resource allocation and prevention: *Who in society decides what negative consequences are to be prevented? On what conceptual and pragmatic bases are resources then committed to preventing the identified outcomes?* The answers to those questions illustrate a critical property of prevention of disabilities. Preventive technologies are applied by all individuals and all institutions in society. Individuals apply them when, for example, they seek prenatal care, wear seat belts, stop (or never start) smoking, reduce their use of drugs, and follow safety instructions on the job. Institutions

apply them at all levels. The Federal Government devotes resources to auto safety, maternal and child health, immunization campaigns, food and drug safety regulation, basic research on the causes and mechanics of disease, airport safety, and (on a less direct level) a foreign policy that reduces military casualties. States and local governments apply resources to similar activities, including health and safety regulation in the workplace and in public institutions such as schools. Industry and other commercial organizations can apply prevention technologies in workplace safety and in programs for alcoholism and drug abuse. Schools teach driver education. The list could, of course, go on. The point is that prevention is not just a Federal or even a governmental responsibility alone.

Governments, however, and especially the Federal Government, are the institutions of society where responsibility has been placed for much of the generation of knowledge about, and development of more technical approaches to, prevention. Especially when prevention is seen as a common good or a public good, the Federal role has been prominent. This is the case, for example, with respect to the encouragement of vaccine development, the regulation of foods, drugs, and medical devices, the development of (or encouragement or mandating of) technologies for safer highways and automobiles, basic research in most areas, and public information campaigns on hazards or risk-associated behavior.

The above decision has referred to the "who" part of the question about the allocation of resources for prevention. "On what bases" resources are allocated is a much more difficult question to address. At the Federal level, Congress creates and funds prevention technologies and programs. The executive agencies administer the programs and decide the finer distribution of the available resources. In both cases, a mixture of humanitarianism, economics, politics, and scientific capability affect the decisions made. As pointed out in the case study on passive restraint systems (see the background paper on this topic), prevention must compete with cure, reduction of suffering, and rehabilitation for each condition or disability. The aspects of a decision listed above apply to both prevention and treatment. *Because*

resources are finite, and often quite limited, resources must be distributed between current treatment and rehabilitation of disabilities and the future prevention of them.

Thus, even if analysis of costs and benefits of prevention versus treatment and rehabilitation indicates that prevention is *economically* and *humanistically* preferable, the existence of people, today, with disabilities means that resources cannot all be allocated to prevention. There is no correct split between prevention and rehabilitation. OTA finds, however, that decisionmakers should more often expand their analysis to include the benefits and costs of devoting somewhat increased portions of resources to prevention, to development of preventive technologies, and to development of effective techniques for delivery of preventive technologies and information on risks.

Further, and very critically, the definitions of disability and handicap gaining prominence in the disability area, and adopted by this report, allow a modified concept of prevention that holds great potential. That is, decisionmakers at the Federal level (indeed, all levels), in addition to allocating resources between prevention of impairments and disabilities and rehabilitation of currently disabled people, could adopt a new, explicit strategy of preventing disabilities from becoming handicaps. The actions embodied in this strategy are not all new, but the idea of seeking opportunities to apply resources consistently and comprehensively to the prevention of *handicaps* is new and could serve as a potentially structuring concept for resource allocation. A disability becomes a handicap when the physical and social environment combines with a disability to prevent the accomplishment of a typical functional task. A physically disabled person who uses a wheelchair will not be handicapped if a prevention strategy has made transportation systems and buildings accessible. A deaf person will not be handicapped in a job or in social functions if telecommunications devices are available and permit the carrying out of the needed functions of communication. Such prevention is not free. In some cases, it may require the allocation of extensive resources. In others, it could be relatively inexpensive—e. g., modifying telephone receivers to make them compatible with hearing aids, or requiring braille

markings on elevator buttons. Each possible intervention should be submitted to analysis. The key, however, is viewing the possible technological intervention not simply as an expenditure but rather as an investment in prevention.

Resource Allocation and Elderly People

An increasingly critical *resource* allocation issue, which will be covered only briefly, is how society and its decisionmakers, *at all levels*, will react to and deal with the changing age distribution of the U. S. population.

Growing old in America has become in some ways less of a threat to one's self-esteem and economic survival than previously. The majority of elderly people are, in fact, self-supporting and relatively healthy. In proportional terms, however, there is a higher incidence of disability among elderly people. The aging process is associated with reduced ability for sight, hearing, and mobility in a higher percentage of elderly people than is found in the general population. The incidence and prevalence of chronic diseases, such as cancers, heart and circulatory conditions, and arthritis, increase with the age of a population. These conditions imply increased need for medical and social services, along with increased costs for those services—and in our society lead to increased dependency. *

The social and financial implications of an elderly segment of the population were serious in the past when about 5 percent of the country's population was age 65 and older. They are critical today: More than 12 percent of the population is age 65 and over, and that percentage may rise to 20 percent or more by 2030. Technological advances in the next 30 years could significantly reduce mortality (death) and morbidity (disease and disability) rates of elderly people, and the proportion of elderly people in the population could rise even more dramatically than anticipated.

Federal decisionmakers make a great many resource allocation decisions that affect and are affected by the population of elderly people. Social Security and Medicare are prime examples of programs involving many billions of dollars.

*This discussion is based on ref. 6.

But policies on other matters such as retirement age, tax treatment of retirement accounts, types of technologies and services provided or paid for by medical and social services programs, tax policy related to voluntary work, and actions relative to age discrimination also affect the allocation of resources for and by elderly people.

This OTA report is on disabilities, not on aging. The resource allocation problems associated with an elderly population are an issue, however, because disability among elderly people will be one of the crucial aspects of their need for funds, services, and policies that allow greater independence and self-determination. The key potential problem of resource allocation posed by an elderly population is the disparity between the fiscal and social contributions by elderly people that policies encourage (or allow) and the fiscal and social needs that increased numbers of elderly people will present.

Analytical Methods for Informing Decisionmaking

Finding an appropriate or feasible match between spending goals and resource capabilities requires adequate information relating to both sides of the "fit." Goals must be clear, explicit, and realistically determined. Capabilities must be understood along several dimensions. Resource *capability means more than simply the availability of funds. It also implies an adequate knowledge base, especially of potential resultant outcomes and of the potential tradeoffs that might be required.*

Much of the needed information cannot be provided adequately by formal analytical techniques. Politics, philosophies, concepts of distributive and compensatory justice,^{*} and emotions are intimate aspects of decisions in the disability-related area. But a substantial amount of the needed, and often inadequate, information base can be provided or

^{*}Compensatory justice deals with distribution of resources in consideration of past harms rendered. Although it is at times a significant element in policy discussions about disability, it has been less important and central to policy than has the concept of distributive justice. Distributive justice deals with the distribution of resources in proper share to each party with a legitimate claim to them. Most often, Western culture in theory bases "proper share on the idea of the fundamental equality of individuals, each with an equal right to the resources required for a satisfying quality of life (183).

at least improved by careful use of formal analysis. The danger is inappropriate use: Analysis cannot replace judgment or overrule less objective but more important considerations.

Role of Analytical Techniques

The inherent complexities and uncertainties associated with many decisions make it very difficult to identify and weigh all the possible consequences of those decisions. Often, however, the *process* of analysis can give structure to the problem in question, can allow an open consideration of all the relevant effects of a decision, and can help force the explicit treatment of key assumptions.

The use of formal analysis in the area of disability-related policy has both its enthusiastic proponents and its skeptical detractors. As with the use of technology, however, the most logical position seems to be that analysis can aid in performing the functions mentioned above when it is adequately conceived and designed, conducted properly, and its results are given only an appropriate weight in the process of making the decision. Analysis can illuminate issues and provide synthesis of relevant data. It can provide numbers. But only rarely can those numbers serve as the sole or primary basis for a resource allocation decision.

Analytical techniques are only tools. They can be ignored, abused, or misused. A challenge to analysts, consumers, and policymakers is to use the tools in an appropriate manner, to strive for the ideal uses, but to recognize and be explicit about the limitations. In an ideal world, they could be used to inform and structure the aspects of the decision process that are listed below:

- clarify and force explicit consideration of goals,
- clarify the problem or opportunity to be addressed,
- identify and describe possible decision alternatives: the technical alternatives, or other possible interventions,
- identify the range of parties at interest,
- identify the potential outcomes—positive and negative—of possible decision alternatives

and the distribution of outcomes among the parties at interest,

- provide a method of considering the potential outcomes together and in relation to the goals,
- provide evaluation of actual v. projected outcomes,
- identify possible changes in interventions based on evaluation results.

These objectives of using analytical techniques are used in a later section as the basis for a suggested approach to a resource allocation framework.

Range of Analytical Techniques

Analytical techniques are often used to provide various types of data used in the lifecycle of technology, as described in parts I and II. Many of these types of analysis are useful for resource allocation in general. Statistical or qualitative surveys of the needs, desires, and capabilities of disabled persons are used for planning services and to generate ideas for needed new or modified technologies. Historically, however, such surveys have concentrated on needs, especially as defined by parties other than the disabled persons themselves. Further, they have been subject to the weaknesses of methodology and concept described in chapter 2 for demographic information. *Demographic studies of populations* of handicapped or disabled people are also used to provide information for technology planning and for other resource allocation decisions. Such studies have often concentrated on categories of impairment as opposed to measures of functional limitation.

Economic and fiscal or budgetary analyses are other analytical tools for decisionmakers. Analyses of funds spent by various Federal and State programs for disabled people may provide useful background information, but usually do not yield data helpful for changing the direction, goals, or organization of programs. It is difficult to combine such analyses with analyses of outcomes to produce some measure of efficiency or even effectiveness. “*Cost of disability studies*, “ to the extent that they go beyond the preceding type of analysis and include measures of costs other than

direct expenditures, can be useful to the setting of goals and decision priorities.

Projections or forecasts of economic or employment conditions help decisionmakers plan for future resource allocation. Obviously, these types of analyses must be used judiciously and with allowance for the inevitable uncertainty of results. Similar caveats are attached to another type of forecasting—that of projections of emerging and future technological developments.

Analyses in the form of *program evaluations and services delivery research and evaluations* are some of the most common information sources used by decisionmakers. These analyses range from sophisticated, large-scale, computer-based studies of program effectiveness to quickly conducted, qualitative studies of, for example, a suggested change in research priorities. There exists no definitive evidence that the usefulness of these techniques is heavily dependent upon their degree of sophistication. A large body of circumstantial evidence that is accumulating, however, indicates analysis should at least follow certain principles of analysis. These principles will be listed at the end of this section.

Most commonly viewed as a technology- or product-specific private sector activity, *market analysis* could actually be helpful in many types of resource allocation decisions by the public sector. Further, improved collection, analysis, and dissemination of some of the above types of analytical data (e.g., demographics, technological forecasts, economic forecasts, disability services R&D) could be of great value to the market analysis efforts of both the public and the private sectors. If a more effective public/private collaboration is desired in regard to disability-related issues, market analysis must no longer be viewed as a tool for use only by profit seekers.

Cost-benefit analysis (CBA) and *cost-effectiveness analysis* (CEA) are relatively common forms of analysis in the disability area. A recent OTA study of the potential usefulness of CEA and CBA included a review and analysis of the health policy and medical literature related to CEA/CBA. * In

*This discussion is based on Background Paper #1. Methodological Issues and Literature Review of OTA's report *The Implications of Cost-Effectiveness Analysis of Medical Technology*, U.S. Government Printing office, September 1980.

its analysis of the growth and composition of that literature, OTA found that a considerable number of articles dealt with birth defects, chronic diseases (especially cardiovascular diseases and kidney diseases), mental health services, geriatric care, and rehabilitation technologies and services. Further, interest in these subjects and CEA/CBA is growing.

The principal distinctions between CBA and CEA lie in: 1) the method of valuation of the desirable consequences of a decision (the benefits), and 2) the implications of the different methods of that valuation. Both are formal analytical techniques for comparing the positive and negative consequences of alternative ways to allocate resources. In CBA, all costs and all benefits typically are valued in monetary (or equivalent) terms. The results of analysis are expressed in dollar cost per dollar benefit, yielding a cost-benefit ratio or, sometimes, a measure of net benefit. Conceptually, therefore, CBA can be used to evaluate the "worth" of a project and would allow comparison of projects of different types (e.g., elevators in subways v. passive restraint systems in cars v. the B-1 bomber). In CEA, on the other hand, desirable consequences are measured not in monetary terms, but in some other units. Then, the ratios of desirable consequences to negative consequences for alternative ways of spending are compared. Thus, competing but dissimilar projects (such as dams v. hospitals) may not be able to be compared adequately with standard CEA methods; similar alternatives, however, can be compared without the difficulty or impossibility of valuing outcomes in monetary terms.

Both CEAs and CBAs have been conducted frequently in the disability area. Their existence, however, does not imply the degree to which these techniques have affected policy. Little evidence exists on the extent of their use, but if experience in health policy is typical, it is probable that they have had only minor impact. The reasons for lack of use are numerous and logical. CEA and CBA suffer from a number of serious weaknesses, both of immaturity and of an inherent methodological nature. Some of these, related to the immature state-of-the-art in the disability or general human services area, may diminish as techniques improve. Similarly, as analysts and policymakers

gain more experience with them, the usefulness of the techniques may increase. Many of the inherent weaknesses, such as inability to deal with questions of equity and distribution, will continue to affect the usefulness of CEA/CBA.

A substantial degree of effort is being put forth in an attempt to advance the methodology of CEA/CBA in the disability area, principally with the support of the National Institute of Handicapped Research (NIHR). For example, a research resource allocation method developed by the Texas Institute for Rehabilitation Research specifically attempts to address the question of non-monetary outcomes (27). That method of CBA uses three general classes of outcomes: 1) outcomes of direct benefit to individuals in the target populations for whom the research is directed, 2) outcomes that are of indirect benefit if the research project is successful, and 3) outcomes of indirect benefit but not related to the success of the project. All three of these classes of benefits may have monetary elements, but each may also include nonmonetary benefits. Enhanced quality of services, improved policy bases for rehabilitation, expanded knowledge bases, and enhanced public awareness of an issue are examples of such non-monetary outcomes. The valuation of the non-monetary measures is accomplished through a system of ranking and weighting by a peer-review-like group of judges. A comparison is made between the "importance" of the various non-monetary measures and the monetary ones in order to assign artificial dollar values to the former.

Another example of current attempts to advance CBA methods in the disability area is provided by the more inclusive, more social-outcome oriented model of Dodson and Collignon (73). This model, which is still in development, is designed to identify and measure outcomes other than simply monetary ones related to vocational rehabilitation in its (new) role vis-a-vis severely disabled persons.

The potential usefulness of such methods is still impossible to determine. On the basis of preliminary reviews, however, OTA finds that the models represent legitimate methodological advances and yet still are prey to weaknesses of most CBA/

CEA applications. The assumptions and data employed leave serious questions about the uses to which any results might be applied. The aspect that most deserves critical scrutiny is their traditional orientation to a quantitative bottom-line.

Principles of Formal Analysis

Whatever form of formal analysis the policymaker decides to use to aid in decisionmaking, certain principles of analysis should be followed. Table 10 lists the 10 principles for analysis that OTA identified in its recent review of CEA and CBA (166).

These principles are the basis of the discussion in the following section. Blum has suggested that an additional principle should be added between Nos. 2 and 3 of table 10—Conduct a problem

Table 10.—Ten Principles of Formal Analysis

1. Define the problem
2. State the objectives
3. Identify the alternatives
4. Analyze the positive consequences
5. Analyze the negative consequences
6. Differentiate the perspective of the analysis
7. Perform discounting
8. Analyze uncertainties
9. Address ethical issues
10. Present and discuss results in a policy context

SOURCE Office of Technology Assessment U S Congress *The Implications of Cost-Effectiveness Analysis of Medical Technology* OTA H 126 (Washington D C U S Government Printing Office August 1980)

analysis. * Problem analysis consists of four basic steps: preparing for analysis, formulating initial problem, identifying problem precursors, and identifying problem consequences.

*H. Blum, University of California, Berkeley, personal communication, Dec. 7, 1981.

STRUCTURING RESOURCE ALLOCATION DECISIONS

The discussion that follows is similar in concept and purpose to the one for appropriate technology decisionmaking in chapter 5. In fact, the framework discussion of chapter 5 should be seen as relating to technology-specific resource allocation. The discussion below is also similar to chapter 5 in that its intent is not to produce a checklist or “cookbook” for decisionmakers, but rather to be a step toward decisionmaking that takes into account the range of relevant variables. The discussion suggests some of the elements that an explicit framework for resource allocation decisions might have. Individual decisionmakers or programs should adopt as much of the material as is helpful. OTA’s purpose here is to provide an orderly way to think about the decision process and its structure.

The discussion is based on two sets of guidelines: 1) the 10 principles of formal analysis, and 2) the list of aspects of the role of analysis in decisionmaking. These may help serve as the basis for structuring decisions, because the primary reasons for discussing and using a structuring rationale is to clarify why a decision is to be made and the problem to be addressed, to be sure all assumptions are explicit, and to force consideration of

all relevant consequences of alternatives. Thus, the goals of analysis are essentially the goals of the decision process. The discussions below will primarily be from the perspective of Federal decisionmakers, but it is important to view them as also applying to other parties, including individuals.

Explicitly Define the Problem

Resources cannot be effectively applied to a problem unless the problem is explicitly stated and adequately understood. It is not *enough merely to specify the goals of resource allocation*. The underlying reason for desiring to reach the goals is an essential part of the policy development process. It will exert tremendous, and often unappreciated, influence on what goals are selected and how those goals are stated. “Development of a portable, lightweight, reliable voice-synthesizing communicator” is of course a goal statement, but unless the organization deciding to devote resources to such development has thoroughly studied the situation that a communicator would be designed to address, it cannot develop more helpful specifications. Similarly, before a portable

voice synthesizer becomes the goal statement, the decisionmakers should have considered the functions that are being sought through technological intervention and the alternative technological approaches possible. That is, the function to be addressed must be considered before the form of the solution is decided. "Make subways accessible" is a goal, but the demographic data and human and economic factors that lead to the need for accessibility are critical to the methods and extent of accessibility to be required. In short, *a clear and open examination of the situation or problem to be addressed is a prerequisite to the realistic and effective setting of goals.*

State Goals in Measurable or Evaluable Terms

After the problem is specified, operational goals must be set. These goals must be expressed in measurable terms, not only because evaluation of progress toward the goals can then be assessed, but also because the form in which goals are expressed will affect the manner in which they are approached. If the Federal Government and the States allocate resources for job training and placement programs and express the associated goals in vague terms of increased employment percentages or increased quality of life and self-image, the programs administering the funds will have little guidance as to how to implement the resource allocation decision. They will be free to pursue high percentages of "placement," paying less attention to length of ensuing employment or level of earnings or job satisfaction. This example is merely hypothetical, but Congress or the States might wish to specify, on the basis of thorough analysis of possible goals, that their desire for the resources is such that the goals require subsequent employment of certain lengths or of certain earnings.

Thus, in structuring resource allocation decisions, *decisionmakers should consider the effects that their statements of goals will have on the implementation of programs and on the ability to do subsequent evaluations of outcomes.* In effect, adequate specification of goals is the method for transmitting signals about the importance of various outcomes to be sought.

Specify the Range of Parties at Interest

A "party at interest" is someone with a stake in the outcome of any action taken that distributes resources. Federal decisionmakers must consider the interests and reactions of a wide range of people and institutions—e.g., from taxpayers and constituents of elected officials, to disabled individuals and groups representing disabled people, to industry and other private organizations, to their own and other bureaucratic organizations.

Each decisionmaker must decide which of the many potential parties at interest will be affected by the decisions made—i.e., any decision will distribute costs and benefits to many parties in, usually, an unequal manner. Which of the parties will incur costs and receive benefits to such an extent that the effects on those parties will need to be considered in choosing among alternatives? Not all potential parties at interest will be the subjects of intensive analysis regarding potential positive and negative effects, but one of the crucial aspects of organizing or structuring a resource allocation decision is identifying an initial broad list of possible parties at interest and then narrowing the list to those that can feasibly be studied for purposes of informing the ultimate decision. A desirable, but frequently ignored, aspect of decisionmaking is involving the principal parties at interest in analyzing the potential alternatives and possible methods of implementing any subsequent allocation of resources.

Identify the Range of Possible Decisions

Resource allocation decisions are rarely of the "Do X or do nothing" type. Instead, they most often involve a choice among a series of alternative ways of distributing resources. What is sometimes missing in the allocation of resources for disability-related programs is creativity in identifying the range of possible alternatives. In the past, most allocation decisions were made on behalf of disabled people with little input from disabled people on possible ways to accomplish the goals addressed. Thus, a source of ideas was not exploited fully. Another factor limiting the range of alternatives has been the categorical nature of Federal programs. Medicare, for exam-

pie, is a medically oriented program. Because of its tradition, perceived and actual mandate, the orientation of its employees, and perhaps its desire not to trespass on areas seen as the responsibility of other agencies, the Medicare program—and the Department of Health and Human Services, and Congress—may see the program's possible range as being limited to primarily medical interventions. This situation may hold even though alternatives that are closer to social services may have a greater potential to improve the "health" of disabled people. This does not imply that the Medicare program is at fault, merely that the categorical structure of organizations restricts a comprehensive consideration of the full range of possible alternatives that might address a particular problem or goal.

The observation above implies two important points for decisionmakers. First, decisionmakers *should consult with disabled persons and other sources of ideas in putting together a list of possible alternatives*. And second, *in the initial analysis of potential options, decision makers should not confine themselves to only those types of options that are strictly within their mandate*. Even when legal, programmatic, or budgetary constraints do not allow the realistic consideration of these additional alternatives, they may be of use to other agencies or other decisionmakers who have a relevant mandate.

Identify, Measure, and Value Potential Consequences of Decisions

Once goals have been set and the range of alternatives, along with the potentially affected parties for each, has been identified, the estimation of "costs and benefits" must take place. Quotation marks have been used to highlight the fact that OTA is *not* simply referring to the results of a traditional CBA. The shortcomings of a simplistic (not a simple) CBA have been discussed above. *It is critical that—for each alternative method of allocating resources—the positive and negative consequences for all significant parties at interest be identified, measured, and (where possible) valued*. This is obviously not a simple task, but it is one for which effort expended can pay large dividends in improved decisions.

The identification-measurement-valuation sequence is especially important. Identification must take place first, obviously, but in addition, it is important that decisionmakers not confine identification to only those items that are quantifiable. Similarly, measurement should not be limited to only those items to which dollar amounts can be assigned or to those with absolute figures as opposed to relative rankings or estimates of magnitude or subjective descriptors. The consequences of encouraging (and allocating resources for) increased participation of disabled people in R&D as scientists and engineers and as consumer representatives will not all be expressed in numbers of placements or numbers of advisory panels served on or numbers of technologies designed or developed with the involvement of disabled persons. Subtle or hard to "measure" improvement in the appropriateness of technologies developed may be a very important outcome. OTA finds that simply their lack of amenability to objective measurement and valuation should not preclude the consideration of such outcomes as an important aspect of allocation decisions.

Consider the Effects of Time (Discounting) and Uncertainty

It is very important for analysts and decisionmakers to be aware that time and uncertainty will affect the estimates of potential outcomes of any resource allocation alternatives. The three key questions that should be explicitly asked and considered before a decision is made are as follows. First, has the analysis of potential outcomes considered the effects of time on the values of future costs and benefits? Second, are the analysis and the decision to be made oriented to short-term outcomes, to long-range outcomes, or to both? And third, have the uncertainties of assumptions, data, future states, and possible outcomes been accounted for in deliberations about the desirability of various alternatives?

Because this is not solely a discussion of resource allocation decisionmaking through the use of formal, quantitative analysis, no definite guidelines for the manner in which time should be taken into account can be given. In formal analysis, a process known as *discounting* is used

when some of the measured positive and negative consequences (benefits and costs) of the alternatives occur at different times. In fact, in most allocation decisions, costs and benefits will occur in a staggered fashion, with costs commonly being incurred in advance of benefits. "Discounting" is in a way similar to applying a reverse interest rate. It is a technique for transforming future amounts (of dollars, for example) to their "present value." Thus, all costs and benefits can be analyzed using their values today.

The rationale behind discounting is a belief that certain properties of resources and time must be taken into account. One is that resources can be invested and earn future gains ("opportunistic cost of capital"). The other is that people prefer benefits today rather than tomorrow and expect to be rewarded for postponing gratification ("social rate of time preference"). Both these properties, in effect, mean that a dollar invested in a program today is a dollar foregone from an alternative use (investment or consumption), and therefore it must appreciate to more than a dollar in the future for the investment to be accepted.

Even when a formal and quantitative analysis is not conducted in support of a decision, it is possible (and desirable) for some informal consideration to be given to the effects of time on the value of the future stream of costs and benefits.

Posing the question of short- versus long-term outcome orientation is much simpler than providing answers as to how to maintain an appropriate balance between the present and the future. This balance, in fact, is one of the hardest and yet most crucial objectives of effective resource allocation. The dilemma can be seen in debates about the proper emphasis placed on basic research versus support of technology adoption, or on prevention versus rehabilitation. Competing but equally critical needs combined with limited resources form the dilemma. Even though this may be obvious, the issue should always be raised and discussed because otherwise the pressures of the present may exert undue influence over decisions.

The importance of considering both present and long range implications can be illustrated by an issue mentioned earlier. That issue is the prevent-

ing of disabilities from becoming handicaps through alterations to the physical and social environments of the disabled person. It may seem more pressing to allocate the limited resources available to specific individuals for personal-assist technologies (e.g., subsidies for closed captioning devices for the television sets of hearing-impaired persons), and yet investment in a more environmentally oriented technological approach may yield higher benefit for greater numbers of people in the future. OTA is not suggesting this is necessarily true, only that current resource allocation does not address such possibilities to an adequate extent.

Every decision to allocate resources is made with some degree of uncertainty. Just as examples, uncertainties exist in regard to the cause of diseases, the distribution of disabilities in populations, the efficacy and costs of diagnostic, preventive, and treatment or rehabilitative technologies, the desires of consumers, future economic indicators, potential effect of education or vocational training, personal habits and needs, and future technological "breakthroughs." These and the many other possible uncertainties will affect the desirability of decision alternatives and the ultimate success of the decisions made. Complete accommodation of uncertainty is never possible. Decisionmakers should, however, identify which sources of uncertainty might strongly affect outcomes and make some effort to consider the changes in predicted outcomes that might accompany incorrect assumptions.

What is suggested here is that such uncertainties be acknowledged and analyzed instead of ignored or hidden. In formal analysis, there is a technique known as "sensitivity analysis" that can be used to vary assumptions about the values of uncertain variables and test changes in values for their effects on predicted outcomes. Sensitivity analysis can often be used to identify which uncertain variables have a substantial effect on outcomes, which variables do not affect outcomes (and whose uncertainty therefore can be ignored), and minimum and maximum values that a variable can take on without changing the desirability of an alternative decision possibility. Sensitivity analysis does not make decisions, but it can increase confidence in estimates of outcomes.

Accounting for uncertainty is just as important when no formal analysis accompanies the resource allocation decision. Although a statistical test of uncertainty might not take place, the decision-maker can informally and subjectively apply tests of reason to the assumptions being used in the decision. This may lead to a decision to postpone a decision until data can be gathered on some assumption, or to a decision to implement the decision on a pilot or demonstration basis, or to a decision to fund two or more programs to accomplish the same purpose, with provision for review of outcomes and subsequent reevaluation of the decision.

Consider Ethical and Other “Nonobjective” Factors

Ethical factors are highlighted for two reasons. First, issues of ethics, values, human dignity, personal worth, justice, compassion, and so on are often central aspects of policy formulation and debate in the disability area. The goals of, for example, independence and civil rights are not ones for which most of the important variables can be expressed in quantifiable terms. This does not mean that such goals or the attendant variables should not occupy a prominent place in decision-making. Resources are not allocated strictly or solely on the basis of expected net return on dollars invested.

The second reason for highlighting ethical and other subjective factors is that, despite their often critical importance, they are frequently omitted or given low weight in policy formulation, either because they are not quantifiable or because they are difficult to deal with. There are no magical solutions to the problem of taking into account subjective and emotionally laden aspects of the allocation of resources. By definition, there is no formula for their inclusion. But, the ethical and other value dimensions of a resource allocation decision can be identified openly to a greater extent than they are at present. And, very importantly, *any formal analyses of the consequences of decision alter-natives can be made more amenable to the consideration of ethical and other subjective factors by a purposeful decision not to seek a single, bottom-line estimation of outcomes.*

Other techniques, such as arraying (listing in perhaps order of importance) the potential results, could be used instead of, for example, a traditional CBA that results in a cost-benefit ratio. That is, the analyst would identify all the relevant potential consequences, measure and value them quantitatively when possible and appropriate, and list those consequences that are not quantifiable in descriptive terms, with some estimate of importance or magnitude if possible. The key, however, is that the analyst would make no attempt to unrealistically quantify or artificially combine factors in order to yield a “clean” answer.

Provide for Evaluation of the Results of Decisions

Providing for evaluation of the results of decisions is a seemingly obvious but frequently undervalued aspect of decisionmaking. As stated above, decisionmaking takes place under conditions of uncertainty. This fact of life must be taken into account by the analyst and the decisionmaker. If the problem to be addressed, the goals to be sought, and the assumptions about consequences have all been specified clearly and in measurable terms, the basis for design of an evaluation component has been established.

Very often, evaluation of past resource allocation decisions has been the responsibility of people or organizations other than those who made the decisions. This situation implies that evaluation will be an “after the fact” activity. Data that readily or effectively support or even allow evaluation efforts will usually not have been collected over the course of implementing the decision. The objectives of the original decisionmakers may not be adequately known by or taken into account by subsequent evaluators. For these reasons, it is important for those individuals or organizations who are making resource allocation decisions (indeed, any decisions) to plan for the evaluation of their decisions. The objectives being sought can be specified in evaluable terms, data systems can be designed into the decision itself, records can be kept on populations and effects, and the timing and criteria for evaluation can be set. “Course correction” possibilities can be examined and set

forth during the process of making the allocation decision.

If Congress is the decisionmaker, it can provide for evaluation directly in legislation or it can less formally plan for it by including a discussion of anticipated evaluation needs and goals in hearings and bill reports. Whether formal or informal, planning for evaluation should include at least the following:

- explicit statement of the problem being addressed, outcomes sought, and assumptions about potential consequences and any other uncertainties;
- highlighting of especially critical uncertainties to be examined during evaluation;
- specification of criteria against which evaluation should take place;
- design of an information system to track variables to be used during subsequent evaluations;
- specification of who is to do such tracking and how the tracking will be funded;
- recommendations or specification of times

for evaluation, organization to do the evaluation, form of the evaluation; and

- any specification or suggestions of possible changes in policy as a result of evaluation information.

Even if fully considered and dealt with by those allocating resources, the eight elements of a resource allocation decision, from explicitly defining the problem to providing for evaluation of the results will not result in obvious or perfect decisions. The goal of presenting them in this report is simply to help make the process of allocating resources more sensitive to uncertainty and to a broader range of interests and possibilities. The list is to serve as a reminder to decisionmakers to explicitly ask themselves: What do I hope to accomplish? Why? Who will be affected in what ways? What assumptions am I making? Am I avoiding the trap of numbers? And have I planned for a test of my decision? These simple questions may require more than simple answers, but they are worth answering.