Federal Budgetary Costs of Blindness

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THE PREVALENCE OF SEVERE VISUAL IMPAIRMENT among the U.S. population was estimated during the late 1980s to be around 3.5 million according to the American Foundation for the Blind (1989). Based on the 1969–1970 statistics on blindness in the Model Reporting Area (MRA), the foundation also estimated that at least 600,000 Americans are considered to be "legally blind"; that is, their clinically measured visual acuity is 20/200 or less, or their visual field in the better eye after optimal correction is 20 degrees or less. A recent study (Tielsch et al. 1990) utilizing a population-based survey, however, has shown that the prevalence rate of blindness in the United States is significantly higher than the statistics reported in the MRA. Based on this recent study and some adjustments for the MRA statistics (U.S. Department of Health, Education, and Welfare 1973), we have estimated that approximately 1.1 million Americans are legally blind.

Accurate information on the cost of blindness and severe visual impairment, however, has not been reported. Two unpublished studies by Cahill and Woolsey (1976) and Hu (1982), prepared for the National Eye Institute, attempted to estimate the economic costs of visual disorders and disabilities using the cost-of-illness model developed by Rice (1966). Cahill and Woolsey reported the total economic and social costs

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of visual disorders and disabilities in the United States to be $5.1 billion in 1972, whereas Hu arrived at an estimated total economic cost of $14.8 billion in 1981. These two studies generated important information, but questions were raised regarding the validity of their disease prevalence data. Neither study explicitly defined visual disorders and disabilities; their estimates included chronic health considerations and acute illness episodes as well as refraction errors.

The purpose of this article is to estimate components of the aggregate federal budgetary costs that accrue to serving blind and visually impaired persons for the span of a person-year of blindness. We also attempt to identify areas that are deficient in data and for which further research is required. We will not consider programs administered by the Department of Veterans Affairs because their program characteristics are different from other federal assistance programs. All expenditures reported here are for federal fiscal years, unless otherwise noted.

No previous work has attempted to document the actual federal budgetary outlays, rather than the overall economic costs of blindness. Benchmark data of this type, however, can have important public policy implications: although the private sector generally pays the health care costs of individuals under age 65, the government frequently bears the economic consequences of visual disability. Many of the major costs encountered by a blind individual accrue to federal insurance and entitlement programs. However, this federal budgetary cost approach necessarily understates the true societal costs because it overlooks outlays by state and local governments and by private sources.

Data and Methods

There are potentially wide disparities in visual acuity criteria associated with blindness. With the exception of some supportive service programs, all major federal assistance programs use as an eligibility standard the statute that defines "blindness" as a visual acuity of 20/200 or less, or a visual field of 20 degrees or less, in the better eye after the best correction.

Blind Americans may be enrolled as beneficiaries or as potential clients in three major categories of federal assistance programs that provide income assistance, health insurance, and supportive service. Blind individuals are also entitled to an additional $1,000 standard deduction on

their federal income tax return. We summarize below the major data sources for program expenditures and participation, along with the methodology by which we arrived at our estimates of the costs of blindness accruing to those programs.

Income Assistance Programs

Social Security Disability Income (SSDI) and Supplemental Security Income (SSI) are the two major federal and federal/state programs that provide income assistance to blind Americans. Program statistics for expenditures and enrollment are routinely published in the *Social Security Bulletin* by the Social Security Administration (SSA). For the SSDI program, however, data are reported for all disabled beneficiaries regardless of the underlying reason for the disability. Because SSDI benefit levels depend primarily on previous earnings, we have assumed that blind persons who are eligible for benefit receive SSDI payments comparable to payments received by other disabled beneficiaries.

The SSI program, on the other hand, was enacted to replace previously separated federal grant programs to states for the aged, blind, and disabled. The SSA thus has traditionally maintained separate enrollment and expenditure statistics for the blind beneficiaries. We derive the per capita benefit payments of SSI from the SSA program statistics.

Health Insurance Programs

Medicare and Medicaid are the two major federal and federal/state programs that provide health insurance for blind Americans. Like SSDI and SSI, Medicare and Medicaid program statistics on enrollment and expenditures are also routinely published by the SSA and the Health Care Financing Administration (HCFA). As in the case of SSDI, Medicare expenditures by primary diagnosis of disabled enrollees are not readily available. There is no separate category for data on the enrollment, utilization, and associated expenditures for blind beneficiaries in the published Medicare program statistics. Unlike SSDI payments, which may be comparable for all disabled beneficiaries, medical care utilization and its associated expenditures may not be the same for various types of disabled persons. In order to overcome this limitation, Riley (1991) linked a 5 percent sample of SSDI beneficiaries to HCFA's Continuous Medicare History file and tracked total Medicare expenditure along with di-

agnoses. A brief discussion of these data and the methodology used is included in the appendix.[1]

Like SSI, Medicaid program statistics for different categories of beneficiary groups, like the aged, the blind, people with disabilities, children supported by Aid to Families with Dependent children (AFDC), are published routinely in the *Social Security Bulletin* and the annual Medicare and Medicaid data book.

Supportive Service Programs

Over 30 major federal programs provide various supportive services for Americans with disabilities. With few exceptions, most of the federal supportive service programs for disabled persons are administered by the Department of Education. We considered four special education programs and one rehabilitation service program that provide relatively "direct" services and whose costs can be attributed to individual blind persons.

Programs such as personnel training, research, and various social services that provide indirect assistance were excluded for both conceptual and empirical reasons. These programs are generally intended to assist all disabled persons. Hence, there is no way to identify expenditures specifically associated with blindness, nor can these indirect costs be attributed on a per capita basis.

Furthermore, if we assume that all of the 16 million working-aged adults who reported a work disability (U.S. Bureau of Census 1989), in addition to the 4 million disabled children under age 20 (U.S. Department of Education 1990), are potential clients for those 30-plus supportive service programs totaling about $590 million in federal outlays in 1989, it is unlikely that a minor change in the annual incident rate of disability would significantly affect federal outlays for these programs. A large-scale reduction in blindness prevalence might reduce the need for some programs, but we do not foresee this possibility.

Because of the characteristics of the programs and the types of services they provide, most federal supportive service programs for the disabled do not maintain detailed program statistics and beneficiary information. One major data source for expenditures and estimated number of program beneficiaries is the *Catalog of Federal Domestic Assistance*, which is published annually by the Office of Management and Budget (OMB). The catalog is a government-wide compendium of all federal programs,

projects, services, and activities that provide assistance or benefits to the American public. The Department of Education's annual report to Congress also contains data on some special education programs implemented by the Education of the Handicapped Act. We obtained our data on the rehabilitation services provided to blind individuals, however, directly from the Rehabilitation Services Administration of the Department of Education because no published statistics were readily available.

Income and Tax Losses

Information regarding the income levels of blind persons is essential in estimating the reduced tax revenues attributable to blindness. Although income tax returns offer one possible source of information for estimating the earnings of blind persons, our analysis based on Internal Revenue Service (IRS) data indicated that about 40 percent of blind adults do not file a tax return, either as an individual or as one party of a joint return (F. Sammartino, Congressional Budget Office 1991: personal communication). Most important, a recent Harris survey suggested that only about one-third of disabled Americans aged 16 to 64 worked either full time or part time (Harris 1986). As tax filers are generally more affluent than nonfilers, earnings estimates from income tax returns can grossly overestimate the income levels of the blind population. Analysis of IRS data shows that the average reported earnings of blind individuals who did file single tax returns in 1987 was $13,319 (F. Sammartino 1991: personal communication). This earnings figure for blind individuals seems surprisingly high given that sighted individuals filing single returns reported similar average earnings of $13,752 in 1987 (table 1).

Another source of information on individual earnings and disability benefits is the Survey of Income and Program Participation (SIPP), which interviews about 20,900 households annually. SIPP was developed by the Office of the Assistant Secretary for Planning and Evaluation of the Department of Health and Human Service, the Office of Research and Statistics of the Social Security Administration, and the Bureau of the Census during the late 1970s and early 1980s. It contains information on individuals' earnings, hours of work, and participation in the labor force and federal programs (e.g., SSI, Medicaid, food stamps). However, questions on blindness were only asked in the 1984 interviews.

The 1984 SIPP included 140 blind adults aged 18 and above, among

TABLE 1
Estimated Annual Earnings for Blind and Sighted Adults, 1987 and 1990

	1987[a]		1990[b]	
Visual status	Adults under 65	Adults over 65	Adults under 65	Adults over 65
Blind	$13,319	$15,417	$4,275	$1,192
Sighted	13,752	10,012	15,253	1,210

Source: Authors' analysis of 1984 Survey of Income and Program Participation (SIPP) data; Internal Revenue Service (IRS) tax return sample data are based on estimates supplied by F. Sammartino (Congressional Budget Office, personal communication, 1991).
[a] Analysis based on IRS tax return sample (n = 100,000).
[b] Analysis based on data from 1984 SIPP (N = 33,082).

whom 40 were aged 65 and over. To account for the possible sampling error in SIPP, we applied weight adjustments to each sample observation when estimating individual incomes, program participation rate, and average benefit payments of the blind population. Our preliminary analysis comparing IRS data and the earnings reported in SIPP for various population groups suggests that earnings information from SIPP should be relatively reliable and thus can be used in estimating the earning potential of the blind population. The small sample (n = 40) of the blind elderly population in the SIPP raises some uncertainty. The data, however, seem to be reliable because no significant differences are shown in either earnings or program participation rates in means-tested assistance programs for the blind elderly and the sighted elderly.

Program Participation Rate

In deriving the federal budgetary costs of blindness, we formulate the costs on a per person-year of blindness basis. The rationale for such an approach is that costs per person-year reflect the potential benefits of preventing a person-year of blindness and thus can be used directly in cost–benefit and cost-effectiveness studies of various prevention and intervention programs. A critical component of this methodological formulation, then, is the participation rate in assistance programs. Because not all blind persons are eligible for the various federal assistance programs, expenditures (per recipient) derived from various sources should

be adjusted to account for the probability that a blind person will, in fact, receive the benefits.

For the blind working-aged adults and elderly, SIPP also provides information about enrollment status in various public programs (table 2). Two factors, however, may contribute to the seemingly low program participation rates in the SIPP data: First, program enrollment is generally underestimated in SIPP because only the civilian noninstitutionalized population is surveyed. The institutionalized population presumably has a higher enrollment rate in various public assistance programs. More important, because of the relatively small sample of the blind population, the onset time of blindness was not considered in our SIPP data. Blind individuals who lose their vision in early childhood may be less likely than those who lose vision during adulthood to be beneficiaries of the SSDI and Medicare programs.

We estimated the program participation rates among the working-aged blind population based on other alternative data sources. In 1991, 96 percent of all jobs in the United States were covered by Social Security and 83 percent of the population was "fully insured" (U.S. DHHS,

TABLE 2
Program Participation and Average Monthly Benefits for Blind Persons, 1990

Program	Program participation[a]		Average monthly individual benefits	
	18–64[b]	65+[c]	18–64[b]	65+[c]
SSDI/OASI	30%	96%	$460	430
SSI	17	10	363	204
Medicare	15	99	N/A	N/A
Medicaid	29	10	N/A	N/A
Food stamps	13	7	72	60
AFDC	3	0	28	0

Source: Author's analysis of 1984 SIPP data.
[a] 1984 estimates.
[b] n = 100.
[c] n = 40.
Abbreviations: SSDI, Social Security Disability Income; OASI, Old-Age and Survivors Insurance; AFDC, Aid to Families with Dependent Children.

Social Security Administration 1990). In addition, 24 percent of the disabled individuals are employed full time (Harris 1986) and thus presumably are not eligible for the Social Security assistance programs because of their earnings. Based on these two factors, and in the absence of better information, we then assume that an estimated 20 percent (i.e., 0.83×0.24) of the working-aged adults will not be eligible for any major public assistance programs when blindness occurs. The remaining 60+ percent fully insured population is assumed to be eligible for SSDI and Medicare, while another 20 percent population will be eligible for SSI and Medicaid.

Finally, we assume that among the blind working-aged adults, only 50 percent will ever participate in rehabilitation programs. This is based on the estimate that each year nearly 41,500 new cases of blindness occur among adult Americans, and about 45 percent of them are between the ages of 20 and 64 (National Society to Prevent Blindness 1980). Comparing this figure of nearly 19,000 cases of blindness each year among working-aged adults with the number of working-aged blind adults participating in rehabilitation programs, we estimate that about 50 percent of the working-aged blind adults will utilize rehabilitation services.

The program participation rates among blind children are not available in any data source. The special education programs, however, can be assumed to have 100 percent enrollment rates. Although SSDI and Medicare programs are not applicable to this population, some may be eligible for the means-tested SSI and Medicaid programs. Without additional information, participation in SSI and Medicaid among blind children can only be assumed to be 20 percent, comparable to that of the blind working-aged adult population.

The program participation rates among the blind elderly is of less concern. For blindness that occurs in the elderly aged 65 and over, SSDI is not applicable because Old-Age and Survivors Insurance (OASI) has automatically become the primary income support program when, or even before, an insured person reaches age 65. Medicare benefits are also available once an insured person reaches age 65. Although Medicare expenditures for the blind elderly may be higher than for the sighted elderly, no data exist on the magnitude of additional expenditures associated with blindness. We assume that the blind do not incur higher Medicare expenditures than sighted persons among elderly beneficiaries, and there is no difference in Medicare participation rate between the

two groups. It is plausible, however, that program participation in SSI and Medicaid among the blind elderly may be higher than that of the sighted elderly. SIPP data suggest that the blind elderly have 3 percent higher Medicaid and SSI participation rates than their counterparts who are not blind. The differences, however, are not statistically significant and thus are not incorporated in our cost estimates.

Findings

As blind beneficiaries at different age groups utilize different federal service and receive varying amounts of benefit, the costs of blindness change with age and onset time of blindness. Table 3 depicts the federal budgetary costs of a person-year of blindness for three different age groups: children, working-aged adults, and the elderly.

Infancy to Age 20

For blindness that occurs in infancy or early childhood, the most immediate federal involvement will be special education programs. The largest federal financial support to states for the education of handicapped children is Handicapped—State Grants, authorized under Part B of the Education of the Handicapped Act (EHA-B). The legislation mandates free public education to all handicapped children under age 21. In 1989, more than four million disabled children were covered by this program with total federal outlays of approximately $1.5 billion, or an annual allocation of $356 per disabled child in 1990 dollars. Fewer than 18,000 of the four million disabled children served by this program in 1989 were classified as visually handicapped or deaf-blind.[2] We have not determined the extent to which the $356 per child allocation is an underestimate or overestimate for visually handicapped children.

Another program, Education of Handicapped Children in State Operated or Supported Schools, supports children not covered under EHA-B who are enrolled in state-operated or state-supported schools. Children enrolled in this so-called Chapter 1 program usually are severely handicapped with multiple disabilities. In 1989, fewer than 200,000 children (6,350 were visually handicapped or deaf-blind) were served under this program with total federal outlays of $148 million, or $584 per child allocation in 1990 dollars. Among the visually handicapped children

TABLE 3
Estimated Federal Expenditures per Person-year of Blindness, 1990[a]

Program	Age			
	3–5	6–20	21–64	65+
Total costs	$2,187	$1,778	$11,896	$32
Special education	937	528	N/A	N/A
SSDI	N/A	N/A	6,376	N/A
SSI	823	823	648	N/S
Medicare	N/A	N/A	1,087	N/A
Medicaid	427	427	427	N/S
Tax loss	N/A	N/A	3,326	N/A
Tax expenditures	N/A	N/A	32	32
Rehabilitation costs	N/A	N/A	712	N/S

[a] All expenditures reported here were adjusted for program participation; rehabilitation costs were not included in the total costs. Abbreviations: SSDI, Social Security Disability Income; SSI, Social Security Insurance; N/A; not applicable; N/S; not significant.

served by these two federal programs, 75 percent are enrolled under the EHA-B program and 25 percent under the Chapter 1 program (U.S. Department of Education 1990). If expenditures for these programs are weighted by the enrollment proportions, annual federal expenditures for visually handicapped children are about $413 (i.e., $356 × 0.75 + $584 × 0.25) per child in 1990.

Complementing these two major programs is the Handicapped Preschool Grants, an incentive program focused specifically on handicapped children aged 3 to 5 years to ensure their access to appropriate education. The average annual federal expenditure has been estimated to be $524 per child in 1990 dollars (Decision Resources Corporation 1988; U.S. Department of Education 1990). Because states could still receive EHA-B and Chapter 1 grants for these preschool children, the annual direct federal outlays on special education in 1990 were thus $937 (i.e., $413 + $524) per disabled child for children aged 3 to 5 years and $413 for children aged 6 to 20. In addition, the American Printing House for the Blind, which supplies all textbooks to blind students, is funded in part by the federal government. The amount of per

capita appropriation, about $115 in 1990 dollars (American Printing House for the Blind 1989), should be added to the $413 per child expenditure for children aged 6 to 20.

Assuming that all blind children receive special education, the federal budgetary cost for special education in 1990 was $937 per person-year of blindness for children aged 3 to 5 and $528 (i.e., $413 + $115) for ages 6 to 20.

Although SSDI and Medicare will not be immediately applicable to this group, some are eligible for SSI and Medicaid benefits. The average annual federal SSI payments for disabled and blind children was $4,116 in 1990 dollars. The average annual federal Medicaid reimbursement for the blind was $2,134 in 1990 dollars. Because we have no data for the program participation rates of blind children, we will assume that SSI/Medicaid program participation rates for blind children are comparable to the 20 percent for blind working-aged adults, which brings the annual federal outlays of SSI per blind child to $823 ($4,116 × 0.20) in 1990 dollars. Similarly, the annual federal outlays of Medicaid per blind child will be $427 ($2,134 × 0.20) in 1990 dollars.

This brings the federal budgetary cost of a person-year of blindness to $2,187 (i.e., $937 for special education and $1,250 for SSI/Medicaid) for children aged 3 to 5 and $1,778 (i.e., $528 for special education and $1,250 for SSI/Medicaid) for children aged 6 to 21 in 1990 dollars. The additional costs associated with other related special education programs were not included in this formulation.

Age 21 to 64

More federal programs are potentially involved for blindness occurring among working-aged adults than among blind children. Both SSDI and SSI benefits, as well as Medicare and Medicaid, are applicable to this age group. Rehabilitation programs are largely funded by the federal government. Tax losses and expenditures must also be considered.

As of December 1989, the average monthly SSDI benefit paid to a disabled worker alone was $572, and the average amount payable to a disabled worker with eligible dependents was $1,020 in 1990 dollars (U.S. Office of Management and Budget 1990). No data have been published, however, on how the average SSDI benefit payment received by blind insured workers differs from that of other disabled beneficiary groups. As SSDI benefit payments depend primarily on previous earn-

ings records, we assume that, on average, blind persons should have received a level of SSDI payments comparable to payments received by other disabled beneficiaries. This amounts to a $6,864 annual SSDI benefit payment for the blind person alone and a $12,240 annual SSDI benefit payment for the family headed by a blind person. However, the percentage of blind beneficiaries who receive either the "family benefit" or the "individual benefit" is unknown.

Because 72 percent of U.S. households are family households in 1988 (U.S. Bureau of the Census 1990), this report assumes that 70 percent of the eligible blind beneficiaries receives "family benefit," whereas the other 30 percent receives "individual benefit." Benefit payments to individuals and families can then be weighted by these percentages to arrive at an average person-year of SSDI benefits of $10,627 (i.e., $12,240 \times 0.7 + \$6,864 \times 0.3$) for a working-aged blind adult in 1990.

In addition to SSDI payments, 75,000 blind persons received *federal* SSI benefit payments with an associated expenditure of $207 million in 1987 (U.S. DHHS, Social Security Administration 1988). The average monthly federal SSI benefit for *all* blind persons was $270 in 1990 dollars, or $3,240 annually.

With respect to health care expenditures, blind Medicare beneficiaries with certain medical conditions, especially diabetes mellitus and end-stage renal disease (ESRD), will incur higher medical costs than the average blind or disabled beneficiaries. Therefore, it is necessary to exclude the extremely high-cost ESRD beneficiaries in estimating the Medicare reimbursement for the blind beneficiaries. According to Riley, Medicare reimbursement per person-year for its non-ESRD blind beneficiaries under age 65 was $1,518 in 1985, compared with $2,273 incurred by all beneficiaries who are blind or have other disorders of the eye (table 4). Updated to 1990 dollars, the figure for the first group rose, by almost $300, to $1,812.

In addition to Medicare, 85,000 blind persons received Medicaid benefits, accounting for more than $309 million in expenditures in 1987 (U.S. DHHS, Health Care Financing Administration 1988). This is equivalent to an annual expenditure of about $3,811 per blind Medicaid recipient in 1990 dollars. Note, however, that because Medicaid is a joint federal and state program, not all expenditures come from the federal budget. On average, the federal share of Medicaid expenditure is about 56 percent (U.S. DHHS, Social Security Administration 1988), or $2,134 per blind recipient in 1990.[3]

TABLE 4
Medicare Reimbursement per Person-year for Medicare and SSDI Blind Beneficiaries, 1985[a]

Beneficiary characteristics	N	Medicare reimbursement per person-year		
		Part A	Part B	Total
All beneficiaries with Eye disorders and/or blindness indicator	2,233	$1,340	$932	$2,273
Blindness indicator	1,142	1,463	1,040	2,503
Diabetes	214	5,282	3,952	9,234
Glaucoma	195	1,523	853	2,376
ESRD	54	17,373	15,126	32,500
Non-ESRD beneficiaries with eye disorders and/or blindness indicator	2,179	N/A	N/A	1,518

Source: Riley 1991.
[a] 5% sample-linked files.
Abbreviations: SSDI, Social Security Disability Income; ESRD, end-stage renal disease.

Taking into account the 60 percent SSDI/Medicare and 20 percent SSI/Medicaid program participation rates suggested earlier, the federal budgetary costs of a person-year blindness for a working-aged adult who becomes blind at adulthood is estimated to be $7,024 (i.e., $10,627 × 0.6 + $3,240 × 0.2) for income assistance programs (SSDI/SSI), and $1,514 (i.e., $1,812 × 0.6 + $2,134 × 0.2) for health insurance programs (Medicare/Medicaid).

Tax loss resulting from lost income is also a major component of federal budgetary costs of blindness. Based on the self-reported earnings in SIPP, we estimated that the average annual earnings of all blind working-aged adults amounted to only $3,431 in 1984, or $4,275 in 1990 dollars. On the other hand, the average personal earnings reported in SIPP by all sighted adults aged 21 to 64 was $12,242 in 1984, or $15,253 in 1990 dollars. Assuming that the demographic and socioeconomic characteristics of the blind and sighted working-aged adult population groups are similar, one can suggest that the potential average earnings of the blind population is comparable to that of the sighted population, that is, $15,253 in 1990 dollars. The result is a loss of

$10,978 potential earnings for the blind working-aged population in 1990. Assuming a marginal federal tax rate of 30.3 percent (15 percent for income taxes and 15.3 percent—7.65 percent for employers and 7.65 percent for employees—for FICA in 1990) on the lost earnings, federal tax loss among the working-aged population is $3,326 per person-year of blindness in 1990 dollars.

In addition, blind tax filers in 1990 are also eligible for an increased standard deduction of $800, if filing single tax returns, or $650, if filing joint tax returns. Assuming that 40 percent of the blind tax filers use single returns and 60 percent file joint tax returns (F. Sammartino, Congressional Budget Office 1991: personal communication) and assuming a 15 percent marginal tax rate for blind tax filers, tax expenditures resulting from the increased deduction would be $107 (i.e., [$800 × 0.4 + $650 × 0.6] × 0.15) per blind American recipient in 1990. However, only about 60 percent of the legally blind adults file income tax returns and it is not clear how many blind filers actually claimed the standard deduction. We assume that, among the blind adults who do file a tax return, 50 percent will claim the additional $650–$800 standard deduction, resulting in an additional $32 (i.e., $107 × 0.6 × 0.5), and thus a total of $3,358 tax loss per person-year of blindness in 1990 dollars.

Summing the $7,024 for income assistance programs (SSDI/SSI) and $1,514 for health insurance programs (Medicare/Medicaid), combined with $3,358 for tax losses, we arrive at a $11,896 minimal federal budgetary cost of a person-year of blindness for a working-aged adult in 1990.

Finally, there is also a, presumably, one-time cost of rehabilitation. Although most rehabilitation services for disabled Americans are administered by states, about 80 percent of the total expenditures for vocational rehabilitation programs are provided through federal grants to state rehabilitation agencies (National Council on the Handicapped 1986). Unpublished data from the Department of Education show that 9,300 blind persons were rehabilitated successfully in 1988 (Mars 1991). The average length of rehabilitation training for these blind persons is slightly more than 2 years (about 26 months) at an average cost of $3,560 per client rehabilitated in 1990 dollars. The federal share of the expenditures is thus $2,848. As we assume that 50 percent of blind working-aged adults will participate in rehabilitation programs, there is an additional $712 rehabilitation cost per person-year of blindness in 1990 dollars for a two-year period.

Age 65 and Over

Participation of the blind elderly in various Social Security programs is not relevant here. Federal budgetary costs that can be attributed to blindness in this population are mostly income tax losses. Potential tax loss or reduced tax expenditures in this age group, however, should be significantly less than for the working-aged group. Based on data from SIPP, the estimated average earned income was $957 for the blind elderly in 1984. Comparing this with the average earnings of the sighted elderly group suggests that vision loss resulted only in a drop of $18 in potential earnings for the blind elderly in 1990. This difference in earnings, however, is not statistically significant at a 5 percent level. Based on this estimate of lost earnings for the blind elderly, we assume no federal tax loss associated with the blind elderly population. As in the case of working-aged adults, however, we assume a $32 tax expenditure per person-year of blindness for the elderly in 1990 dollars. *Taking into account the assumptions that no differences in program participation rates exist for the blind and nonblind elderly, this report estimates the federal budgetary costs of a person-year of blindness for the elderly to be $32 in 1990 dollars.* This figure, however, can be higher if the blind elderly Medicaid recipients have a higher rate of nursing-home utilization than their sighted counterparts. (We will study and report nursing-home utilization among the blind elderly in another article.)

Aggregate Annual Costs of Blindness

In addition to the estimated costs of a person-year of blindness, we need to know the prevalence of blindness across age groups to arrive at an estimate of aggregate annual costs of blindness. The most widely cited statistics on blindness, the Model Reporting Area (MRA) study, however, is almost 20 years old and is also known to have greatly underestimated the prevalence rate of blindness, especially among the elderly population. Recently, Tielsch et al. (1990) have shown that the prevalence of blindness among the U.S. adult population aged 45 and over is significantly higher than indicated by the MRA statistics. Based on the prevalence reported by Tielsch et al. and adjustments of the MRA statistics for the population under 45 years of age, we have estimated that approximately 1.1 million Americans are legally blind.

Table 5 depicts the composition of the blind population across age groups. Among the estimated 1.1 million Americans who are legally

TABLE 5
Annual Federal Budgetary Costs for Blindness, 1990

Age	White			Black/other			Total U.S. projected cases	Annual federal budgetary costs per case	Total budgetary costs for legal blindness[c]
	Population[a]	Blindness rate[b]	Projected cases	Population[a]	Blindness rate[b]	Projected cases			
All ages	207,750	0.0043	884,084	38,581	0.0057	219,541	**1,103,625**	—	**$4,128,730**
Under 5	14,879	0.0001	1,488	3,577	0.0003	1,073	**2,561**	$2,187	**5,601**
5–19	42,614	0.0009	38,353	10,289	0.0012	12,347	**50,699**	1,778	**90,143**
20–44	82,957	0.0014	116,140	15,646	0.0030	49,938	**163,078**	11,896	**1,939,976**
45–64	39,999	0.0030	119,997	6,003	0.0090	54,027	**174,024**	11,896	**2,070,190**
65–74	15,993	0.0057	91,160	1,904	0.0224	42,650	**133,810**	$32	**4,282**
75–84	8,629	0.0211	182,072	893	0.0293	26,165	**208,237**	$32	**6,664**
85+	2,679	0.1250	334,875	269	0.1351	36,342	**371,217**	$32	**11,879**

Source: U.S. Bureau of the Census 1990.
[a] The population figures, in thousands, are as of July 1, 1988.
[b] The prevalence rates of bilateral legal blindness among U.S. adult population aged 45 and over are from Tielsch et al. (1990). The prevalence rate of bilateral legal blindness among U.S. population aged 44 and under are based on the MRA statistics with a 100 percent augmentation, as we believe that the MRA statistics underestimate the true prevalence rate of blindness by as much as 50 percent.
[c] In thousands.

blind, about 53,000 are under 20 years of age, about 337,000 are 20 to 64 years of age. The remaining 713,000, almost two-thirds of the entire blind population, are accounted for by the elderly aged 65 and over. Given the estimated annual federal budgetary costs of blindness and the prevalence of blindness across the age groups, table 5 also summarizes aggregate federal budgetary costs of blindness in 1990 by age groups. It shows that aggregate federal budgetary costs of blindness in 1990 totalled approximately $4.1 billion dollars. Almost 97 percent of the amount is accounted for by the working-aged adult group, which, however, constitutes less than one-third of the total blind population. This $4.1 billion annual federal budgetary cost of blindness, although not significant compared with the $362.5 billion total federal expenditures on Social Security and Medicare in 1990, represents more than 0.3 percent of the total federal budget outlays in 1989.

Discussion

Our estimates of the costs of blindness focus solely on federal expenditures, in contrast to those based on the cost-of-illness approach developed by Rice (1966). Costs typically included in the cost-of-illness studies, such as reduced productivity and output loss, do not contribute directly to federal budgetary costs. On the other hand, transfer payments and tax losses are added to our estimates, but are excluded from the typical cost-of-illness studies.

From the federal government's perspective, transfer payments and tax losses are arguably the most essential elements of costs associated with blindness. From the societal point of view, there are certainly deficiencies associated with this budgetary costs approach. The federal government, however, can be seen as a payer of the services provided to the blind community. From the payer's perspective, social opportunity cost may not be as appropriate as the budgetary expenditures in a cost–benefit and cost-effectiveness analysis.

Our findings clearly demonstrate that blindness imposes considerable costs, not only on the individual and his or her family, but on the federal government as well. Although we have not measured the true economic cost to society associated with blindness and visual impairment, we believe that our analysis of the direct federal budgetary cost may be

the more important yardstick as policy makers grapple with restructuring the national health system and consider the issue of preventive services.

Another limitation of these data is that our estimates are based only on the individual's current age and do not consider age at onset of blindness. Government expenditure for a working-aged adult who has been blind since early childhood may differ from that for a person who becomes blind as an adult. This issue can only be addressed via primary data collection in a representative sample of blind and visually impaired persons. In considering costs of blindness among the elderly population, however, age of onset is not a factor that affects federal outlays. Most federal outlays to the blind elderly are not affected by the presence or absence of vision loss. As Medicaid becomes one of the primary funding sources for nursing-home care, however, increased nursing-home utilization resulting from avoidable blindness may impose additional strains on the Medicaid budget. Although our preliminary analysis suggests no evidence of high nursing-home utilization rates among the blind elderly, it is an area requiring further exploration and data.

In this respect, it is especially worthwhile to note that the working-aged adult group accounts for less than one-third of the blindness cases, but contributes almost 97 percent of the aggregate annual federal budgetary costs of blindness. Similar information regarding productivity lost because of blindness among this group can also be inferred from our findings. If one assumes that lost wages can be used to approximate productivity lost in a national economy, our analysis of annual tax loss for the federal government also suggests that approximately $3.7 billion in wages is lost because of blindness in the working-aged adult group.

One immediate implication of such findings is that blindness among the working-aged adults, more than any other age group, exacts an especially high toll from the federal government and the economy. Most important, vision loss can frequently be avoided by early detection and proper treatment. A study on diabetic retinopathy, a leading cause of new cases of blindness among working-aged Americans (National Society to Prevent Blindness 1980), has demonstrated that proper treatment can effectively reduce the occurrence of severe vision loss by about 50 percent (Diabetic Retinopathy Study Group 1981).

Complete and reliable incidence and prevalence data, unfortunately, are not available to warrant a full discussion of the epidemiology of blindness and the extent to which blindness cases can be avoided

through timely detection and treatment. Our preliminary estimates based on the recent Baltimore Eye Survey (Tielsch et al. 1990) and the 1970 MRA statistics (U.S. Department of Health, Education, and Welfare 1973), however, suggest that as many as 7,700 and 85,000 prevalence cases of blindness in the United States among children under 20 years old and working-aged adults, respectively, are either curable or preventable when there is timely treatment and detection. If all the preventable blindness is avoided, an estimated $1.0 billion in potential savings accrues each year to the federal budget (table 6).

From a purely cost–benefit perspective, the critical issue then is whether the economic costs associated with vision loss outweigh the costs of interventions that are designed to prevent it. Our current study, in this respect, provides an important basis for performing the cost–benefit analysis of prevention programs from the federal government's perspective. We have previously reported that the cost of preventing blindness from diabetic retinopathy (Javitt et al. 1991) is far less expensive than paying the costs associated with needless blindness. In fact, enrolling a single person with Type-I diabetes in proper care achieves a net annual savings of approximately $10,000 in federal budgetary expenditures (after discounting at 5 percent). Analyses of prevention programs targeting other causes of blindness are ongoing.

TABLE 6
Estimated Annual Federal Budgetary Savings from Preventable Blindness Among Persons Aged 64 and Under

Age[a]	Annual federal budgetary costs per case	Curable/preventable blindness cases			Total preventable cases	Total recoverable costs[b]
		Cataract	Glaucoma	Diabetic retinopathy		
Total		45,572	26,869	20,227	92,668	$1,024,460
Under 5	$2,187	703	14	0	717	1,568
5–19	1,778	6,845	168	0	7,013	12,469
20–44	11,896	16,477	3,871	5,769	26,117	310,688
45–64	11,896	21,547	22,816	14,458	58,821	699,735

[a] The prevalence rates of bilateral legal blindness among the U.S. population of persons aged 64 and under are based on MRA statistics with 100 percent augmentation.
[b] In thousands.

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Appendix Notes

1. The data were obtained by linking the Continuous Medicare History Sample (CMHS) to the 10 percent Disability Sample file (see table 2). The latter file, which is created and maintained by the Social Security Administration, contains information on SSDI beneficiaries at time of award, including primary and secondary diagnoses and a statutory blindness indicator. We selected records of SSDI beneficiaries entitled between 1979 and 1985, whose Social Security numbers (SSNs) put them in the CMHS sampling frame, and with a primary or secondary diagnosis of eye disorder (ICD codes 360–379) or an indicator of statutory blindness on the file. These records were linked to the Health Care Financing Administration's CMHS, which contains Medicare cost and utilization information, summarized on an annual basis, for a 5 percent sample of Medicare beneficiaries. Month and year of birth and SSNs were used to perform the link. We then selected records indicating Medicare Part A entitlement in 1985 and age under 65 in 1985.

   Average Medicare reimbursements in 1985 were computed by summing Medicare reimbursements across beneficiaries and dividing by total months of Medicare entitlement for the group in 1985.

2. The program classified each handicapped child into one, and only one, of the following disability conditions: visually handicapped,

deaf-blind, other multihandicapped, hard-of-hearing or deaf, mentally retarded, seriously emotionally disturbed, learning disabled, speech impaired, orthopedically impaired, and other health impaired (U.S. Department of Education 1990). Whether visually handicapped refers to the strictly defined "legally blind" is not clear. One problem with such a classification system is that it largely underestimates the number of children who are visually handicapped. As some visually handicapped children also have other serious disabling conditions, they are likely to be classified under other conditions for one reason or another. Data from the American Printing House for the Blind (1989), which furnishes textbooks to registered legally blind school children, support such concern, as it reported more than 46,000 legally blind students in 1989. Why there exists such a significant difference in the number of blind children reported by the DOE and APB data is unknown.

3. This Medicaid expenditure figure, however, is an estimate that needs to be viewed with caution because blind beneficiaries who have ESRD are not excluded due to limitations of the data. On the other hand, it could be an underestimate for the elderly beneficiaries because they use nursing-home service at a higher rate than other beneficiaries. Medicaid program statistics showed that $16 billion was spent for the 3.3 million elderly recipients in 1987 (U.S. DHHS, Social Security Administration 1988). This resulted in an annual expenditure of $5,593 per elderly Medicaid recipient in 1990 dollars. Elderly recipients in nursing-home care consumed an even higher average of $9,381 annually. Should blind elderly Medicaid recipients utilize nursing-home services at a higher rate than their sighted counterparts, Medicaid expenditures associated with the blind elderly will be still higher. Our preliminary analysis of the 1985 National Nursing Home Survey (NNHS) data, however, does not suggest that the blind elderly utilize nursing-home services at a higher rate than their sighted counterparts.

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