How Free Care Improved Vision in the Health Insurance Experiment

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Abstract: We studied reasons for the improvement in the functional vision of enrollees receiving free care in the Rand Health Insurance Experiment. Among low income enrollees, 78 per cent on the free plan and 59 per cent on the cost-sharing plans had an eye examination; the proportions of those obtaining lenses were 30 per cent and 20 per cent, respectively. Visual acuity outcomes of low income vs non-poor enrollees were more adversely affected by enrollment in cost-sharing plans. Free care resulted in improved vision by increasing the frequency of eye examinations and lens purchases. (*Am J Public Health* 1989; 79:640–642.)

Introduction

Over half of the US population wears corrective lenses.[1] In 1972, Americans spent $352.2 million on visits to ophthalmologists[2] and, in 1977, $1.6 billion on optical goods.[3] In 1975, 20 per cent of Americans had out-of-pocket expenditures for optical care.[2] Among automobile drivers, vision impairments are a major cause of accidents.[4]

The Rand Health Insurance Experiment (HIE) demonstrated that cost sharing reduced the use of health services,[5,6] but participants receiving free care had better visual acuity at the experiment's end than did those randomized to cost-sharing plans.[7]

In this paper, we explain why enrollees receiving free care had better corrected visual acuity and describe the amount of care for correcting visual acuity that was received by a non-aged general population.

Methods

Health Insurance Experiment (HIE)

The Rand HIE, a randomized trial of cost sharing, was conducted between November 1974 and January 1982 in six cities, among 3,958 enrolled persons ages 14–61 in 2,005 families; 70 per cent were enrolled for three years and 30 per cent participated for five years. Details about study design, sites, and participant exclusions have been previously reported.[8,9] The sample was a random sample of six communities. With the important exception of those over the age of 61 at enrollment, the sample is otherwise reasonably representative of the United States population with respect to age, sex, income, education, proportion Black, and marital status. The age distribution of participants in the free and cost- sharing groups were equivalent: 13 per cent aged 14–17, 17 per cent aged 18–24, 30 per cent aged 25–34, 19 per cent aged 35–44, 13 per cent aged 45–54, and 8 per cent aged 55–61. Families were assigned to one of 14 cost-sharing plans that varied in the degree of cost-sharing. The primary variation was in the coinsurance rate: 0, 25, 50, or 95 per cent, but out-of-pocket expenses were limited to $1,000 per family per year with a reduced amount for low-income families. All plans covered ambulatory and hospital care, preventive services, dental services, mental health care, and prescription drugs. Vision services were covered, subject to varying cost sharing, as follows:

- One eye examination for refractive purposes per year;
- One pair of corrective lenses per year. There was an additional out-of-pocket cost for contact lenses, and sunglasses were not covered unless medically necessary;
- One pair of frames every two years, with a maximum payment based on the normal price of standard frames in that area. The coinsurance rate for these services was based on the coinsurance rate for a given plan. For example, if the coinsurance rate was 25 per cent, then 75 per cent of the charge for refraction, glasses, and frames was reimbursed.

This analysis considers all enrollees age 14–61 at enrollment who entered and remained enrolled for the entire duration of the study. It excludes enrollees who died during the study and those enrolled in the HMO (health maintenance organization) portion of the experiment.

Assessment of Vision Status

Enrollees completed a medical history questionnaire both at entry to and exit from the experiment. This included questions about use of corrective lenses, presence of vision problems in daily life (e.g., Can you read the newspaper? Can you recognize a friend across the street?), and history of vision care.

In addition, the proportion of enrollees with corrective lenses on entry was equivalent in the free and cost-sharing groups. A random 60 per cent of enrollees at entry and all enrollees at exit received vision tests with and without lenses. Each eye was tested separately with the Snellen Eye Chart or the illiterate E chart and with the Rosenbaum near vision card. Visual acuity when tested without corrective lenses was termed "natural" acuity; when tested with lenses "functional" acuity. Examinees who did not wear glasses and had natural far vision worse than 20/20 or who wore glasses and had functional far vision worse than 20/20 were tested for pinhole acuity.

Explicit quality-of-care criteria specific to vision problems were developed by a panel of physicians and were reviewed by ophthalmologists. These focused on both processes and outcomes of care, including the presence of impaired functional vision at the end of the experiment, and are presented in full elsewhere.[10]

Analysis

We constructed a tree (Figure 1) that considered the points at which vision could have been affected by free care. Each branch represents a path to normal or impaired vision. We defined our population of interest as the 2,399 enrollees with natural vision impairment at entry or exit. (This number differs slightly from that reported in Brook, *et al*,[8] because we considered enrollees with near or far vision impairment at

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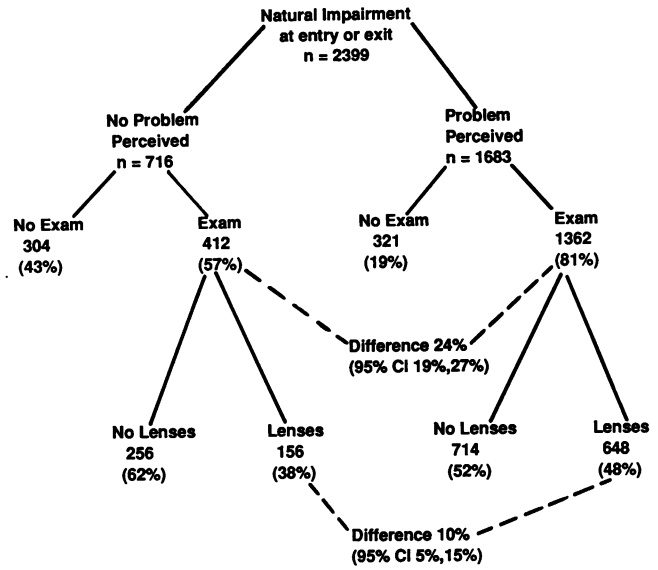

FIGURE 1—Relation of Perceived Vision Problem to Likelihood of Obtaining Lenses
All percentages refer to the n on the preceding branch.
Exam refers to eye examination during Health Insurance Experiment.

entry *or* exit). Because virtually no one in the experiment underwent a procedure to improve natural vision, such as cataract removal, we can assume that those with natural impairment at the beginning also had natural impairment at the end of the experiment and that the presence of such impairment was not affected by plan.

In this analysis, all cost sharing plans were grouped together into a single category, because the differences among cost-sharing plans with respect to vision outcomes were negligible.[9] Two-tailed T-tests were used to contrast variables on the free and cost-sharing plans.

Results

The prevalence of perceived vision problems at enrollment was 70 per cent on both free and cost-sharing plans. Those enrollees who perceived a vision problem were more likely to have an eye examination than those who did not, and those who both perceived problems and had their eyes examined were more likely to obtain lenses than those who did not perceive a problem but nonetheless received an examination (Figure 1).

TABLE 1—Effect of Cost-Sharing on Process of Care for Vision Problems

Measure	% on Free Plan (n)	% on Cost-sharing Plan (n)
Perceived vision problem	70 (579)	70 (1104)
Had eye examination if problem perceived	90 (519)	76* (843)
Purchased lenses if problem perceived and had eye examination	48 (250)	47 (398)
Purchased lenses if problem not perceived but had eye examination	41 (67)	36** (89)

*Difference 14% (95% CI 6, 22)
**Difference 5% (95% CI .1, 9.9)

Effect of Cost-Sharing on Care

Of those who perceived problems, 90 per cent on the free plan and 76 per cent on cost-sharing plans received an eye examination (Table 1). However, once eye examinations were performed on those who perceived vision problems, enrollees on free and cost-sharing plans obtained lenses with similar frequency. In contrast, enrollees who did not perceive a problem with their vision but who nonetheless had an eye examination were somewhat more likely to obtain lenses if they were on the free plan.

Poor enrollees, defined as those in the lower one-third of the income distribution, were as likely as non-poor enrollees to perceive problems with their vision (70 per cent and 71 per cent, respectively). Poor enrollees with natural impairment who were on cost-sharing plans were less likely to have an eye examination than those on the free plan. Moreover, conditional on having an examination, they purchased fewer lenses (Table 2). While these differences were also present for the non-poor, they were less pronounced.

We also studied those enrollees with functional near visual acuity worse than 20/40 at enrollment. Of this group, 8 per cent of the poor and 25 per cent of the non-poor on cost-sharing plans purchased lenses necessary to correct vision to 20/20, while there were no statistically significant

TABLE 2—Effect of Cost-Sharing on Vision Care for Poor and Non-poor Enrollees

	Free			Cost-sharing			Free Minus Cost-sharing	
	Poor (n)	Non-Poor (n)	Diff. (95% CI)	Poor (n)	Non-Poor (n)	Diff. (95% CI)	Poor (95% CI)	Non-Poor (95% CI)
Process								
% with natural impairment having an eye examination	78 (215)	86 (466)	8 (3,3)	59 (285)	74 (808)	15 (9,21)	19 (12,26)	12 (10,14)
% with exam and with natural impairment who purchased lenses	30 (82)	43 (235)	13 (6,20)	20 (98)	35 (389)	15 (11,19)	10 (4,16)	8 (3,13)
Outcome								
% who obtained lenses during the HIE if functional near vision at enrollment was 20/40 or worse in one or both eyes	18 (49)	22 (76)	4 (−3,9)	8 (74)	25 (147)	17 (13,21)	10 (5,15)	−3 (−9,3)
% with exit functional far visual acuity equal to or better than pinhole acuity	80 (340)	83 (622)	3 (−2,8)	76 (594)	81 (1275)	5 (2,8)	4 (0,−8)	2 (−1,4)

differences in the purchase of lenses between poor and non-poor on the free plan (Table 2).

At exit, somewhat fewer poor than non-poor enrollees on the cost-sharing plans had their vision maximally corrected, while the difference in visual acuity between the poor and non-poor groups on the free plan was a bit less (Table 2).

We compared results (i.e., whether vision was corrected) by plan type for enrollees who received a vision examination at entry and those who did not. Unlike the results for a similar analysis in hypertensives,[11] this demonstrated that differences in the screening entry examination did not improve the exit vision outcomes.

Table 3 shows the mean number of visits to an ophthalmologist or optometrist during the three years of the experiment. Both visits and lens purchases were more frequent for enrollees on the free care plan. In addition, high income enrollees received more vision care than did low income enrollees.

Discussion

It was previously reported that free care resulted in improved vision. One possibility was that participants on the free plan obtained corrective lenses more often than those on the cost-sharing plans. This was true for low-income enrollees. Our analysis suggests that a different mechanism accounted for improved vision in the general population—more eye examinations. It is also noteworthy that visual acuity outcomes for low-income enrollees were adversely and differentially affected by cost-sharing.

In contrast to hypertension,[11] there was no favorable effect of the entry examination on vision outcome in the cost-sharing group. This may be due to the fact that entry examination results were reported only to the enrollees' primary physician, not to their optometrist or ophthalmologist. The enrollee's primary physician may have been less likely to act upon a report of vision results than upon a report of poor blood pressure control.

The explanation that more frequent visits led to improved outcome held for three conditions: vision impairment, hypertension, and dental problems. All three of these conditions are relatively common and inexpensive to diagnose and treat. It is probable that the increased visit rate on the free care plan resulted in increased detection of these diseases. This effect was most pronounced for low income enrollees.

TABLE 3—Use of Services for Vision in the HIE Sample Over a Three-Year Period

	Poor			Non-poor		
	Free (277)	Cost-sharing (479)	Diff.	Free (544)	Cost-sharing (1099)	Diff.
Mean # visits (including 0)	1.63	0.92	.71	1.80	1.37	.43
Mean # lenses (including 0)	0.46	0.29	.17	0.69	0.50	.19

(sample sizes appear in parentheses)

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