The Lessons and Limitations of the Rand Health Insurance Experiment[1]

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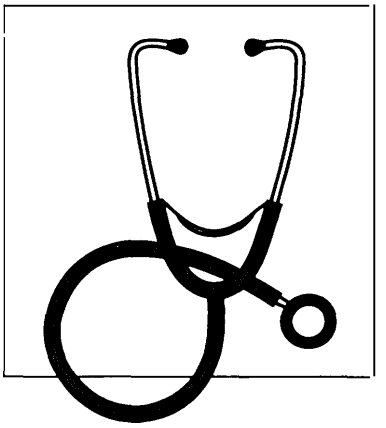
The Rand Health Insurance Experiment is the most relevant and valuable research available concerning the effects of patient cost-sharing. The HIE was a randomized, controlled trial specifically designed to study how various cost-sharing arrangements affect the use and cost of health services as well as health outcomes.[2] This chapter examines the lessons and limitations of the experiment focusing on basic physician and hospitaI care services.[3]

Other notable studies of the effects of patient cost-sharing are reviewed in appendix D. Also see table 3-1 for a summary of the characteristics of the other important studies on the effects of cost-sharing on utilization, expenditures, and health.

DESCRIPTION

The Health Insurance Experiment (HIE), conducted by the Rand Corporation between November 1974 and January 1982,[4] employed a true experimental design to determine the effect of patient cost-sharing on the utilization and cost of medical services, and on patients' health status.[5] The HIE is widely regarded as one of the most important studies ever conducted in the health services area, and its results—particularly with regard



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[2] See OTA's background paper, ''Does Health Insurance Make a Difference?,' for a review of the literature examining the effects of health insurance per se on access to and use of care and health outcomes (78).

[3] Although not reviewed here, there is an additional Rand HIE literature examining the effects of cost-sharing on dental care and mental health care (e.g., ref. 5 and 91).

[4] The Rand experiment was in the field during this period, but the design phase of the HIE began earlier and analysts continue to use the experiment's rich database today.

[5] The study was funded by the U.S. Department of Health and Human Services.

Table 3-I-Selected Studies on the Effects of Cost-Sharing on Utilization, Expenditures, and Health

Study authors and year	Type of study	Number in sample	Location of study population
Scitovsky and Snyder, 1972 and Scitovsky and McCall, 1977 (based on 1966 and 1968 data)	Interrupted time series;[b] studied a prepaid health plan that imposed a 25% coinsurance for all physian services.	2,567 Stanford University employees and their dependents.	Palo Alto, CA (single clinic).
Rand Health insurance Experiment; various authors (based on data from Nov. 1974-Jan. 1982)	Randomized trial? studied the effects of various coinsurance rates and out-of-pocket maximums.	5,814 persons in 2,005 families.	Six sites: Dayton, OH; Seattle, WA; Fitchburg, MA; Franklin County, MA; Charleston, SC; Georgetown County, SC.
Fahs, 1992 (based on 1976-1978 data)	Nonequivalent group design[d] studied the UMWA health plan before and after the institution of a $7.50 pervisitcopayment and compared it with the United Steelworker's health plan which did not change during the same time period.	1,089 UMWA[e] and nonUMWA patients diagnosed with diabetes meilitus, urinary tract infection, or sore throat.	New Kensington, PA (single clinic).
Cherkin, Grothaus, and V@-ner, 1990-91 (basedon 1985 data)	Nonequivalent group design;[d] studied the effects of a new $5.00 repayment on State employees compared with Federal employees who had no copayment requirements.	30,415 Washington State and 21,633 Federal employees enrolled in the Group Health Cooperative of Puget Sound.	Seattle, WA (single staff-rnodel HMO).

a Full citations are listed at the end of this report.
b Interrupted Time Series: A type of quasi-experiment in which the effects of an intervention are inferred from comparing measures of performance (e.g., use of health care services) taken at many time intervals before the intervention with measures taken at many intervals *afterwards* (19). Quasi-experiments are experiments that have interventions, outcome measures, and experimental units, but do not use random assignment to create the comparisons from which intervention-caused change is inferred.
C Randomized Trial: Randomized experiments are characterized by the use of initial random assignment for inferring intervention-caused change (19). Randomized trials are often used to test the safety and efficacy of a medical technology in which people are randomly assigned to experimental or control groups, and outcomes are compared.
d Nonequivalent Group Design: A type of quasi-experiment in which the responses (e.g., use of health care services) of a treatment group and a comparison group are measured before and after a treatment (19). However, study participants are not randomly assigned to treatment versus comparison conditions, and the design is subject to threats to internal validity related to selection-maturation (i.e., respondents in one group could be changing more so than in the other group).
e UMWA refers t. United Mine Workers of America beneficiaries.

SOURCE: Office of Technology Assessment, 1993.

to the impact of cost-sharing on the use and cost of care-are widely used in the cost projections of various health care reform proposals.

Approximately 5,800 persons in six sites[6] were randomly assigned, for three years or five years, to one of over a dozen fee-for-service health insurance plans.[7] The study included individuals and families who, before participation in the experiment, had private health insurance or Medicaid coverage as well as those who were uninsured. As an inducement to participate in the experiment, participants were to be compensated on a monthly basis if their current (preexperimental) health insurance policy provided more financial

6 The sites were: Dayton, Ohio; Seattle, Washington the city of Fitchburg and Franklin County, Massachusetts; and the city of Charleston and Georgetown County, South Carolina.

7 The HIE also randomly assigned a group of people to an HMO in the Seattle area to assess the effect of an HMO *delivery system* (not patient cost-sharing) on utilization and health outcomes, but that component of the study is not within the scope of this report.

protection than the insurance plan to which they were randomly assigned.[8] The primary exclusion criteria were that the 3 percent of the population with the highest income (over $25,000 in 1973 dollars[10]) and people age 62 and over were excluded from the sample. Other people excluded from the sample included those eligible for Medicare due to disability, those in jails or institutions, military personnel and their dependents, and veterans with service-connected disabilities (46).

All the participants in the study received health insurance coverage that was, in part, income-based.11 The experimental health plans varied on two dimensions: the coinsurance rate and the out-of-pocket maximum. Coinsurance was imposed on all medical services and rates were set at O percent,[12] 25 percent, 50 percent, and 95 percent; out-of-pocket maximums (which applied to all plans with a coinsurance rate above O percent) were set at either 5 percent, 10 percent, or 15 percent of family income per year, but could never exceed $1,000 ($750 in some sites) .13 Finally, one plan (called the "individual deductible' plan) provided free inpatient care but had a $150 dedeductible[14] per person for outpatient services.

All of the HIE health insurance plans provided the same benefit package. Coverage was atypically comprehensive; prescription drugs, preventive care, and the services of a wide range of providers were fully covered.[17] Participants had

8 Suppose, for example, that a person had a policy with a $500 out-of-pocket annual maximum. If the person was assigned to the no-cost-sharing plan, he or she would not be eligible for a cash subsidy because that person would never be worse off financially under the experiment. If, however, the person was assigned to a cost-sharing plan, he or she could spend up to $1,000 or a particular percentage of income, whichever was less. If the person faced a $1,000 maximum out-of-pocket liability under the experiment but only $500 beforehand, he or she was given a subsidy of $500 per year to participate. In that way, becoming involved in the experiment could not make the person worse off.

9 In addition, the designers of the HIE were concerned that participants might become medically uninsurable during the course of the experiment (13). To ensure that all HIE participants would continue to have access to health coverage after the experiment every participant was reimbursed for the amount they had to payout-of-pocket for their premiums. This kept participants' preexperimental health insurance active during the experiment and available to the participants afterwards,

10 Inflating this by the change in median household income, this is the equivalent of approximately $78,000 in 1992 dollars.

11 The out-of-pocket maximum was the only cost-sharing feature based on income.

12 The 'O percent plan is generally referred to as the 'free care' plan in the HIE literature but is referred to by OTA as the 'no-cost-sharing plan" throughout this paper.

13 The $750 or $1,)00 annual limits were constant throughout the &year course of the experiment, so there is no single 1992 equivalent. Even if one were to use the midpoint of the experiment (1978) as the base, there is still no unambiguous way to inflate, for example, $1,000 to 1992 dollars. Using growth in median household income, the $1,000 figure would be about $2,000 in 1992 dollars. Using the overall consumer price index (CPI), it would be about $2,151. Using growth in the medical component of the CPI, it would be about $3,076. Using growth in per capita personal medical expenditures, it would be about $3,900.

14 Using the midpoint of the experiment as the base year (i.e., 1978) and inflating by the overall consumer price index, this would be about $323 in 1992 dollars.

15 The structure of this plan was actually somewhat more complicated. patients were responsible for paying 95 percent of outpatient expenses per year up to an out-of-pocket maximum of $150 per person, with a total family limit of $450. According to the HIE researchers, this effectively amounted to a $150 outpatient deductible with care provided free after the deductible was met (41).

16 The purpose of the individual deductible plan was to allow the researchers to e xamine the extent to which price induces people to substitute inpatient for outpatient care.

17 coverage included inpatient and outpatient hospital care, physician services, ancillary services (e.g., X-ray and laboratory tests), skilled nursing facility ***stays, maternity benefits,*** up to 52 mental health visits per year, prescription drugs, certain over-the-counter medications for selected conditions (e.g., chronic allergic conditions, arthritis, pregnancy, and chronic respiratory disease), dental care, vision care (including eyeglasses), hearing care, home health care, preventive services, substance abuse treatment and rehabilitation family planning, acupuncture (if performed by a physician), and equipment and supplies (including prosthetic devices). A wide range of providers was covered, included chiropractors; audiologists; clinical psychologists; optometrists; podiatrists; physical, occupational, and speech therapists; Christian Science nurses; and private duty nurses. The principal exclusions from coverage were most orthodontics, cosmetic dental services, and cosmetic surgery (12).

complete freedom of choice of providers and there were no limits on providers' discretion to order services for patients. Payments to providers were based on 'reasonable or standard' charges .18

LIMITATIONS OF THE RAND HIE

Despite its status as the only true experimental test of the effects of a variety of levels of patient cost-sharing, it is important to recognize that the HIE had several limitations which hamper its usefulness to policymakers of the 1990s (see box 1-B presented earlier in this paper). As a result, it became essentially a study of the *average* use of health care paid for on a fee-for-service basis by nonelderly individuals who were either well- or very well-insured. Because of sample size, the HIE was especially weak at assessing the health effects of cost-sharing on certain population subgroups, even those included in the experiment. These subgroups included people who may have had substantial health care needs, including low-income children and adults, adults with chronic conditions such as cancer and rheumatoid arthritis, and children with chronic diseases such as asthma, congenital anomalies, or with life-threatening conditions. Thus, the health effects of patient cost-sharing on many individuals with *greater than average* health care needs remain largely unknown.

In addition, the HIE could not examine how providers would respond to national-scale changes in patient cost-sharing. This dynamic could have important cost implications if, for example, widespread increases in patient cost-sharing diminished demand for health care services and providers responded by increasing their fees or the volume of services they provide to their patients. Also, some HIE providers were aware that their patients were participating in a federally funded experiment. It is not known whether this knowledge may have affected provider behavior.

Finally, by design, participants in the HIE were subject to numerous unique interventions including: requirements to complete a biweekly diary on health care use, symptoms, and restricted activity; annual health questionnaires; and even compensation if the participants' preexperimental health insurance policy provided more financial protection than the insurance plan to which they were randomly assigned. These features are not typical of most insurance policies, and they may have affected the conclusions of the study.

KEY FINDINGS

Within the caveats above, the HIE generated a wealth of published reports related to coinsurance and its effects on health care use and outcomes.[19] The key findings of the experiment are discussed below in the context of seven fundamental questions key to the development of cost-sharing policy.

Does patient cost-sharing affect utilization of health care services?

In general, the HIE found that coinsurance was a significant deterrent to health care utilization.[20] Above all, coinsurance reduced the number of medical care contacts for which treatment was sought (46). However, once someone in the experiment sought medical attention, the amount and intensity of services that **they received was largely unaffected by coinsurance and apparently was determined principally by physicians or other health care providers (36).** That is, as coinsurance requirements increased, people

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18 Except in rare instances, the HIE paid the providers' charges in full (51).

19 Although the Rand researchers typically describe the experimental health plans as being 'cost-sharing' or 'free care'' plans, the principal type of cost-sharing analyzed was coinsurance. Unless this review of the HIE indicates otherwise, the reader can assume that ' 'cost-sharing' refers to coinsurance and that separate effects of varying coinsurance level are not available.

20 The Rand findings imply a decline in utilization of 2,0 percent with every 10 percent increase in cost-sharing similar to earlier results reported by Scitovsky and McCall (see appendix A) (46,66).

were less likely to seek *any* ambulatory care.[21] HIE participants who were subject to any coinsurance had, on average, at least one fewer contact with a provider each year than the participants who had *no* cost sharing. Probably as a result, those subject to coinsurance were also much less likely to be hospitalized and, on average, received fewer prescription medications, procedures, and diagnostic tests (i.e., X-rays and laboratory tests), compared with participants who did not face coinsurance requirements (24,43).

Similarly, although the likelihood of being hospitalized was significantly lower in the cost-sharing plans—'paying' patients were hospitalized about one-third less often than enrollees with no cost-sharing-average costs per hospital stay for the cost-sharing and no-cost-sharing plans were not significantly different (36). In addition, a widely held view concerning the relationship of inpatient to outpatient health insurance coverage was not supported by the Rand experiment (46,63). It had been previously thought that increasing outpatient benefits, while holding constant inpatient coverage, would reduce total expenditures by encouraging early intervention in the outpatient setting. Instead, on average, HIE participants who had to pay some portion of their outpatient costs but no portion of their hospital care had lower total costs overall (46).

Finally, coinsurance was found to deter care significantly for more than half of the diagnostic categories studied, including chronic, acute, and preventive care (see table 3-2) (43). This effect was strongest among low-income participants,[22] especially low-income children (see more on income effects below). For example, the likelihood that a low-income child on a cost-sharing plan had an episode of outpatient care for the diagnosis "diarrhea and gastroenteritis" was only 37 percent of that of low-income children with *no* cost-sharing. As another example, low-income women subject to cost-sharing were half as likely as similar women without cost-sharing to seek medical attention for "vaginitis and cervicitis."

Effects of Out-of-Pocket Maximums and Deductibles

HIE analysts found that deductibles alone appear to reduce use of services.[23] They also reported no differences in utilization by the coinsurance groups with differing out-of-pocket maximus.[24] The Rand researchers had hypothesized that once people in the cost-sharing groups exceeded their annual out-of-pocket maximums, they would seek care at the same rate as those who had no cost-sharing at all. This did not take place, however, leading the Rand researchers to speculate that "people may not have the energy or inclination to think about their future insurance status' when making medical care decisions (37).

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21 This finding represents face-to-face contacts with physicians, osteopaths, or other providers and excludes visits for only radiology, anesthesiology, or pathology services. Dental care and outpatient psychotherapy are also excluded.

22 Low-income in this analysis was equivalent to family incomes as great as *two* times the Federal poverty level (FPL). The FPL was estimated to be $14,343 for a family of four in 1992 (83).

23 Strictly speaking, with one exception (the ''individual deductible' group) the HIE did not employ deductibles. As noted earlier, the ''individual deductible' plan was actually devised as a plan that required 95 percent coinsurance for outpatient expenses per year up to an out-of-pocket maximum of $150 per person, with a total family limit of $450. No cost-sharing was required for inpatient services. This arrangement was functionally equivalent to a $150 outpatient deductible with *no* cost-sharing after the deductible requirements were met. In addition, the group that had to pay 95 percent coinsurance for all covered services faced a deductible approximately equal to the size of their annual out-of-pocket maximum (5, 10, or 15 percent of income up to $750 or $1,000 per year).

24 For this reason, almost all the HIE analyses were conducted by coinsurance category, grouping together the different out-of-pocket maximums.

Table 3-2—Summary of the Significant Differences Between Rand Health Insurance Experiment Health Plans in the Predicted Probability of an Episode of Care

Condition or service	The relative probability of an episode of care in a cost-sharing plan compared with the no-cost-sharing plan[ab]	Cost-sharing population subgroup[c]
General medical examination	5470	Low income adults
	71	Nonpoor adults
	68	low-income children
	79	Nonpoor children
Vision examinations	58	low-income adults
	61d	Low-income children
Hay fever	39	Low-income adults
obesity	49	Nonpoor adults
Acute upper respiratory infection	49	low-income children
	65	Nonpoor children
Acute pharyngitis	54	Low-income adults
	68	Nonpoor adults
	56	low-income children
	82	Nonpoor chiidren
Otitis media	45d	Low-income adults
	~ d	Low-income children
Diarrhea and gastroenteritis	37	law-income children
Vaginitis and cervicitis	50	low-income women
	54	Nonpoor women
Skin rashes and other noninfectious skin diseases	57	Low-income adults
	69	Nonpoor adults
	w	low-income children
Lacerations, contusions, and abrasions	58	Low-inmme adults
	72	Nonpoor adults
	46	low-income children
Acute sprains and strains	33	Low-income chiidren
Other injuries and adverse effects	72	Nonpoor adults
	44	Low-inmme chiidren

a All effects of cost-sharing shown in this table significant at $P < 0.05$ unless otherwise indicated.
b Shows th, probability of seeking care for those subject to cost-sharing divided by the probability of seeking care for those with 110 cost-sharing.
c "Low-income" includes anyone with a family income up to 200 percent of the Federal poverty level (FPL). "NonPoor" includes those with family incomes greater than or equal to 200 percent of the FPL.
d Significant at $P < 0.10$.

SOURCE: Lohr, K., Brook, R., Kamberg, C., et al., "Use of Medical Care in the Rand Health Insurance Experiment, Diagnosis- and Service-Specific Analyses in a Randomized Controlled Trial, "contract report prepared forthe U.S. Department of Health and Human Services, contract No. 01 66-S0, Santa Monica, CA, December 1966. Used by permission.

Does coinsurance reduce utilization by promoting the use of more cost-effective, appropriate care and by discouraging the use of unnecessary services?

Advocates of patient cost-sharing argue that requiring patients to bear some of their costs of car-e will motivate them to ''think twice' before seeking medical attention and lead patients to make better choices between appropriate and inappropriate care (49). The Rand researchers attempted to validate this claim by examining whether coinsurance equally deterred patients from seeking care for conditions for which treatments were thought to vary in effectiveness. In one analysis, more than 80 conditions and symptoms were divided into four groups: 1) those where medical care interventions were judged *likelylikely to be highly* effective, 2) quite effective, 3) less effective, or 4) ineffective or self-care effective (see table 3-3).[25] They found that higher coinsurance rates apparently did *not* lead the study population to make better decisions about their medical care (43). In fact, coinsurance generally reduced the seeking of care that was judged likely to be "highly effective" and likely to be ''rarely effective' equally. One study subgroup was an exception: children from average-to above-average-income families. For these children, apparently, their parents did selectively reduce their use of medical services in favor of care that was more likely to be ''highly effective. '

In addition, a separate analysis found that coinsurance did not selectively reduce ''inappropriate" hospital stays among adults (70).[26,27] In fact, cost-sharing deterred both "appropriate" and ''inappropriate' hospitalizations based on the criteria used by the researchers. Using the HIE researchers' appropriateness criteria, Siu and colleagues estimated that, when cost-sharing was required for both out- and in-patient services, there were almost 22 percent fewer "appropriate' hospital stays and 27 percent fewer ' 'inappropriate" hospital stays.

Does cost-sharing have health effects?

Overall, the HIE health-related findings are inconclusive but they do suggest that some individuals, especially lower income persons in poor health, may be harmed by the deterrent effects of cost-sharing. In general, the HIE researchers concluded that *not* having cost- sharing led patients to seek *more* medical care, but they were unable to find much evidence that, for the average participant, *more care* led to better health outcomes. Nor did they find much measurable harm, in the short term, from Less care among average participants. (See box 3-A for a summary of the sources of information on health status used in the HIE.) In only three areas did the adults with *no cost-sharing* experience better health outcomes: diastolic blood pressure (i.e., hypertension), the estimated risk of dying for those who were at elevated risk, and corrected vision:

a) *Hypertension*—Having *no* cost-sharing significantly reduced diastolic blood pressure for clinically defined hypertensives by an average of

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25 The groupings were developed through an iterative ranking process by Rand physicians and were also based on the actual content Of participants' insurance claims data. Thus, for example, although chest pain may be a serious symptom, the claims analysis found that, for the purposes of insurance claims, it was actually being used as a catch-all diagnosis for minor complaints. Consequently, for the medical effectiveness analysis, chest pain was placed in the least effective category.

26 The determination of "appropriate" and "inappropriate" hospital stays was based on physician reviews of patients' hospital records using the Appropriateness Evacuation Protocol (70). This technique assesses unnecessary days of hospital care based on 27 criteria related to medical services, nursing and life-support services, and the patient's condition (see ref. 27). Physician reviewers were allowed to override the protocol based on their clinical judgment.

27 Pediatric admissions, admissions related to pregnancy and to alcohol rehabilitation, and psychiatric admissions were excluded from the analysis by Siu and his colleagues (70).

Table 3-3-Medical Effectiveness Groupings Used in the Rand Health Insurance Experiment

- Group 1: Highly Effective Treatment by Medical Care System
  - Medical care highly effective: acute conditions
    - Eyes-conjunctivitis
    - Otitis media acute
    - Acute sinusitis
    - Strep throat
    - Acute lower respiratory infections (acute bronchitis)
    - Pneumonia
    - Vaginitis and cervidtis
    - Nonfungal skin infections
    - Trauma-fractures
    - Trauma--lacerations, contusions, abrasions
  - Medical care highly effective: acute or chronic conditions
  - Sexually transmitted disease or pelvic inflammatory disease
    - Malignant neoplasm, including skin
    - Gout
    - Anemias
    - Enuresis
    - Seizure disorders
    - Eyes—strabismus, glaucoma, cataracts
    - Otitis media not otherwise specified
    - Chronic sinusitis
    - Peptic and nonpeptic ulcer disease
    - Hernia
    - Urinary tract infection
    - Skin-dermatoptrytoses
  - Medical care highly effective: chronic conditions
  - Thyroid disease
    - Diabetes
    - Otitis media chronic
    - Hypertension and abnormal blood pressure
    - Cardiac arrhythmias
    - Congestive heart failure
    - Chronic bronchitis, chronic obstructive pulmonary disease
    - Rheumatic disease (rheumatoid arthritis)
- Group 2: Quite Effective Treatment by Medical Care System
  - Diarrhea and gastroenteritis (infectious)
  - Benign and unspecified neoplasm
  - Thrombophlebitis
  - Hemorrhoids
  - Hay fever (chronic rhinitis)
  - Acute pharynitis and tonsillitis
  - Acute middle respiratory infections (tracheitis, laryngitis)
  - Asthma
  - Chronic enteritis, mlitis
  - Perirectal conditions
  - Menstrual and menopausal disorders
  - Acne
- Group 2 (Continued)
  - Adverse effects of medicinal agents
  - Other abnormal findings
- Group 3: Less Effective Treatment by Medical Care System
  - Hypercholesterolemia, hyperlipidemia
  - Mental retardation
  - Peripheral neuropathy, neuritis, and sciatica
  - Ears-deafness
  - Vertiglnous syndromes
  - Other heart disease
  - Edema
  - Cerebrovascular disease
  - Varicose veins of lower extremities
  - Prostatic hypertrophy, prostatitis
  - Other cervical disease
  - Other musculoskeletal disease
  - Lymphadenopathy
  - Vehicular accidents
  - Other injuries and adverse effects
- Group 4: Medical Care Rarely Effective or Self-Care Effective
  - Medical care rarely effective
    - Viral exanthems
    - Hypoglycemia
    - obesity
    - Chest pain
    - Shortness of breath
    - Hypertrophy of tonsils or adenoids
    - Chronic cystic breast disease
    - Other breast disease (nonmalignant)
    - Debility and fatigue (malaise)
  - Over-the-counter or self-care effective
    - influenza (viral)
    - Fever
    - Headaches
    - Cough
    - Acute URi
    - Throat pain
    - Irritable colon
    - Abdominal pain
    - Nausea or vomiting
    - Constipation
    - Other rashes and skin conditions
    - Degenerative joint disease
    - Imw back pain diseases and syndromes
    - Bursitis or synovitis and fibrositis or myalgia
    - Acute sprains and strains
    - Muscle problems

SOURCE: Lohr, K., Brook, R., Kamberg, C., et al., "Use of Medical Care in the Rand Health Insurance Experiment: Diagnosis-and Servi--spedfic Analyses ina Random izedControlledTrial," contract report prepared forthe U.S. Department of Health and Human Services, Contract No.016B-80, Santa Monica, CA, December 1966. Used by permission.

Box 3-A—The Sources of Information on Health Status Used in the Rand Health Insurance Experiment

The health status information used to evaluate the health effects of patient cost-sharing in the Rand Health Insurance Experiment were drawn from the following sources:

- A comprehensive medical history questionnaire that collected data on general health status, health habits, and about 20 important chronic diseases from all participants (and from parents on behalf of children under age 14) upon enrollment and exit from the experiment (12).
- A medical screening examination that was performed on a randomly selected 60 percent of the sample at enrollment and on all participants at exit from the experiment. The medical screening consisted of a thorough physical examination and numerous physiological measurements, including blood pressure, serum cholesterol level, visual acuity, shortness of breath, hearing loss, glucose intolerance, thyroid abnormalities, hemoglobin, and other tests (39).
- An annual questionaire completed by all adult paticipants regarding their functional limitations in everyday life due to poor health and whether they visited a physician in the past month for an inventory of 27 serious and minor symptoms (12). Examples of the serious symptoms include chest pain when exercising, loss of consciousness, and shortness of breath with light exercise or light work. Minor symptoms include cough without fever for less than one week, nose stopped up for two weeks or more, and an upset stomach for less than 24 hours.
- A biweekly diary on health care use, symptoms, and restricted activity for each family member that the designated head of the family completed throughout the full term of the experiment (12,64,68).

SOURCE: Office of Technology Assessment 1993.

1.9 mm Hg (38).[28] The improvement in blood pressure among those with hypertension was even greater for participants with low incomes than for high-income participants (i.e., 3,5 vs 1.1 mm Hg improvement).[29]~[30] The reduction in blood pressure was achieved largely through additional physician contacts, where problems were diagnosed and treatment initiated. In the no-cost-sharing plan, one-half of the gain in hypertension control derived from a screening entry exam that led to notification of patients' physicians when hypertension was identified.[31] The deterrent effect of coinsurance on use of services among the 856 HIE participants with hypertension is particularly striking. There were 42 HIE participants with hypertension who never visited a physician dur-

28 Participants were identified as ''hypertensive" on entry into the experiment if they (a) reported taking antihypertensive drugs; (b) were found to have a repeated systolic blood pressure greater than or equal to 160 mm Hg or diastolic blood pressure greater than or equal to 95 mm Hg during the physical examination; (c) had a repeated systolic blood pressure greater than or equal to 140 mm Hg or diastolic blood pressure greater than or equal to 90 mm Hg and reported that their physician had previously told them they were hypertensive; or (d) reported that a physician had told them more than once they were hypertensive and were among the random sample that did not get an entry physical exam or had systolic blood pressure greater than or equal to 130 mm Hg or diastolic blood pressure greater than or equal to 80 mm Hg. Others were called ''hypertensive' upon exit from the experiment if they met criteria& b, or c or if (e) they had both repeated enrollment and exit systolic blood pressure greater than or equal to 140 mmHg or diastolic blood pressure greater than or equal to 90 mm Hg or (f) a physician had reported on an insurance claim form ***and the*** participants reported they had been diagnosed as hypertensive, or the physician had reported hypertension on two or more insurance claim forms (38).

29 In this analysis, low income was defined as the bottom 20 percent of the study sample's income distribution (an average $7,300 for a family of four in 1982 dollars); high income was defined as the top 40 percent (an average $40,000 for a family of four in 1982 dollars) (38).

30 The 1.1 mm Hg apparent ''improvement' among high-income hypertensive participants was not statistically significant.

31 A random sample of 60 percent of the HIE study population had a physical examination upon entry into the experiment (12).

ing the study (i.e., three to five years). Only five of these 42 were on the no-cost-sharing plan—significantly fewer than would be expected statistically if cost-sharing had no effect on utilization. In addition, those without cost-sharing were more likely to reduce smoking and to keep to a low-salt diet, and they tended to follow their medication regimens more closely.

The hypertension findings and the vision results (reported below) led the Rand researchers to conclude that *not having cost-sharing* benefits people the most when they have specific conditions that physicians have been trained to diagnose and treat (11).

b) ***Risk of Dying***—For high-risk HIE participants,[32] the estimated risk of dying from any cause (''on the basis of smoking habits, cholesterol level, and systolic blood pressure' '), was an average 10 percent higher in the cost-sharing plans (see Box 3-B) (12). This difference was significant and mostly related to the greater improvement of blood pressure in the plans without cost-sharing. Low-income participants at risk for hypertension had the greatest reduction in risk of dying—overall, their risk was 14 percent lower if they were enrolled in a no-cost-sharing rather than a cost-sharing plan. The potential risk of death from other causes (e.g., cancer, liver disease) was not assessed.

c) ***Vision***[33]—Not having cost-sharing significantly improved corrected vision among average participants in the HIE (11,44). Lurie and her colleagues have reported that the improvement in vision was largely due to an increased number of eye examinations received by people in the no-cost-sharing plan (44). Once the *average* HIE participant received an eye exam, coinsurance appeared to have no effect on their obtaining corrective lenses. However, this was not true of low-income individuals.[34] Low-income enrollees with impaired vision were the least likely to have an eye exam if they were in a cost-sharing plan and they purchased fewer lenses if they did have an eye exam.

Among children, the single, *measurable,* poor health outcome was found among children of low-income families (90). Low-income children who were at highest risk of anemia were much less likely to have anemia at the end of the study if they were enrolled in a plan without cost-sharing than if they were in a cost-sharing plan.

While the above suggests that cost-sharing poses health risks in only a few instances, this finding is confounded by the HIE conclusion that coinsurance significantly kept individuals from potentially effective treatment, even hospitalizations that appeared to be appropriate (43,70). How is it that coinsurance substantially reduced the use of care thought to be "highly effective" but without any *measurable* harm? Some observers have noted that the overall health effects component of the HIE findings is basically a ''nonresult' (56). Others have concluded that the obvious mixed messages of the HIE health-related findings rest in part on the limited measures of health and appropriateness of medical care available to the Rand researchers (60). Even today the methods for measuring health outcomes and effectiveness of care are relatively immature and their ultimate usefulness is still uncertain (77).

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32 The high-risk group included the 25 percent of the sample who were the least healthy, based on their initial levels of serum cholesterol, blood pressure, and cigarette smoking. For example, a person was considered to be at elevated risk of hypertension if he or she had a diastolic blood pressure reading of 83 mm Hg. or more, or was taking hypertension drugs at enrollment (11).

33 Vision services were subject t. the same cost-sharing requirements as other services, but coverage was limited to: one eye exam for refraction purposes per year; one pair of corrective lenses per year (contact lenses had an additional charge); and one pair of frames every two years, with a maximum payment based on the typical price of standard frames in that area (44).

34 In this analysis, low income was defined as the bottom one-third of the HIE study population's income distribution% equivalent to 200 percent of the Federal poverty level.

Box 3-B—The Risk of Dying Related to Patient Cost-Sharing

Brook, Ware, Rogers, et al., provide the following example to illustrate the magnitude of the gains associated with no patient cost-sharing relative to any cost-sharing in the Rand Health Insurance Experiment (HIE):

> ''An average 50-year-old man in the late 1970's had approximately a 5-percent chance of dying within five years (U.S. Public Health Service, 1980). A 50-year-old man at elevated risk had approximately double that chance of dying. If 1,000 50-year-old men at elevated risk were enrolled on a free[1] rather than a cost-sharing plan, then we would anticipate that about 11 of them, who would otherwisee have died, would be alive five years later (1,000 x 0.05 x [2.11 - 1.90] = 10.5). "2

The magnitude of the effect of cost-sharing on low-income[3] men at elevated risk is even more dramatic, even with the conservative assumption that 50-year-old low-income men are only at *average* risk (i.e., 5-percent chance within five years) of dying. The HIE results imply that if 1,000 low-income 50-year-old men at elevated risk were enrolled in a no-cost-sharing rather than a cost-sharing plan, then we would anticipate that about 15 of them, who would otherwise have died, would be alive five years later (1,000 x 0.05 x [2.13 - 1.83] = 15,0).[4]

1 The Rand researchers used the term "free" to describe the no-cost-sharing Plan.

2 For high-risk HIE participants, the relative risk of dying was found to be 2.11 for those in the cost-sharing plain and 1.90 for those in the no-cost-sharing plan.

3 Low-income was defined as the bottom 20 percent of the HIE study sample's income distribution (an average $7,300 for a family of four in 1982 dollars or about $10,613 in 1992 dollars).

4 For high-risk, low-income HIE participants, the relative risk of dying was found to be 2.13 for those in the cost-sharing plans and 1.83 for those in the no-cost-sharing plan.

SOURCE: Based on an example provided in 'The Effect of Coinsurance on the Health of Adults: Results from the Rand Health Insurance Experiment" (p. 26) by Robert Brook, John Ware, William Rogers, et al., under a grant from the U.S. Department of Health and Human Services, December 1984.

It is especially important to recognize, as acknowledged by the HIE researchers, that the small size of the HIE study population may have masked the effects of cost-sharing on health and access to care for certain groups with greater than average health care needs, especially low-income ''at-risk' persons, chronically ill children and adults, and people with relatively rare conditions (e.g., cancer *or* congenital anomalies). Although these groups were too few in number to generate *measurable* results in the experiment, they make up an important proportion of the general population and, by definition, have substantial health care needs.

It may also be that by examining the impact of cost-sharing on health status for only three to five years, the study could not detect clinically significant effects that manifest themselves only over a longer period. For example, the HIE research found that coinsurance led to significant reductions in Papanicolaou (Pap) smears among women ages 45 to 65 (see below) (45), but they were not able to identify any related harm (e.g., higher rates of cervical cancer among women subject to cost-sharing) within the time period studied.

In addition, the Rand investigators suggest that the health *benefits* of not having cost-sharing in the HIE may have been offset by the adverse effects of *unnecessary* care-leading to no measurable *net* effect on the typical participant (12,43). For example, HIE participants in the no-cost-sharing plan used 85 percent more antibiotics than those who were subject to coinsurance (24). The increased use of antibiotics was across all diagnoses, including conditions such as viral infections, for which antibiotic use is ineffective and inap-

propriate. As a result, people in the no-cost-sharing plan were found to be much more likely to suffer adverse effects from the unnecessary use of antibiotics.

Does cost-sharing help to control overall expenditures?

It is clear that coinsurance has a major impact on expenditures, at least in the short term. The total anual medical expenditures of individuals (i.e., insurer payments plus patients' out-of-pocket costs for covered services) who were not subject to cost-sharing in the HIE were 23 percent higher than those with a 25 percent coinsurance rate, and 46 percent higher than those with a 95 percent rate (46).

As noted earlier, coinsurance reduced costs almost entirely by deterring people from seeking any medical attention, including potentially effective treatments. The *long-term* cost implications of deterring potentially effective health care services are not known.

How are individuals with low incomes affected by cost-sharing requirements?

Patient cost-sharing was based, at least in part, on income in the HIE. This feature of the experiment probably moderated the effects of cost-sharing on lower-income families. That is, since the maximum limit on expenditures in the HIE was income-related, poor families were the most likely to exceed their annual out-of-pocket cost ceiling, after which all covered services became free.[35] Without this protection, lower-income families in cost-sharing plans might have spent even less on medical care than they did during the experiment (41).

Nonetheless, even with the income protections in the HIE health plans, the Rand findings reveal a pattern of greater cost-sharing effects on HIE participants with lower incomes. As noted above, individuals in the experiment with lower incomes used care less often than those who were better off financally, sometimes with striking results. For example, cost-sharing significantly increased the estimated risk of dying for some low-income men (also see box 3-B). In addition, low-income adults who began the experiment in poor health, and were enrolled in a no-cost-sharing plan, reported the largest reduction in serious symptoms[36] during the course of the study (68).

The HIE working definitions of 'low income' and "poor" differed across the series of published Rand findings. In many of the HIE reports, "low income" was used to describe persons whose family incomes were at the bottom 20 percent of the HIE income distribution, well below the Federal poverty level (see, for example, ref. 12,39). Because of sample size limitations, some important HIE analyses used a much broader definition of low income, one that included a large segment of the working population with family incomes as great as two times the Federal poverty level (see, for example, ref. 4,41,43,44,46). These HIE analyses could have implications for as many as one out of three nonelderly individuals in the U.S.[37]

Regardless of how "low income" is defined, policymakers should be aware that there is no evidence to suggest that cost-sharing's greater deterrent effect on those with lower incomes

35 The maximum out-of-pocket liability remained at $750 or $1,000 throughout the experiment. These limits, however, would never have been reached by a low-income person because the most they could have paid was 15 percent of their income before reaching their own maximum.

36 Serious symptoms include chest pain when exercising; bleeding other than nose bleeds or periods not caused by accidents; loss of consciousness, fainting or passing out; shortness of breath with light exercise or light work; and weight loss of more than 10 pounds (unless through diet).

37 Unpublished data from the March 1992 Current Population Survey show that 71,889,000 nonelderly U.S. residents, or 32.5 percent of all nonelderly U.S. residents, lived in families with incomes below 200 percent of the Federal poverty level in 1991 (21).

ceases at a rigid dollar income threshold. In addition, the HIE analysts concluded that *sick,* low-income individuals are the most likely to benefit from receiving health care services at no out-of-pocket cost (11).

Do coinsurance requirements affect children differently?

The HIE found that, in general, coinsurance had similar effects on children's and adults' use of and expenditures for outpatient care.[38] Among *average* children, coinsurance led to about one fewer. office visit per year (4). This less frequent contact with health care providers significantly reduced pediatric preventive services, especially immunizations among children under age 7 (45). Sixty percent of children in the no-cost-sharing plan received a well-care examination, immunization, or tuberculosis test; only 49 percent of the children in the cost-sharing plans had at least one of these preventive services.

Adults in cost-sharing plans had approximately one-third fewer hospital stays than others. By contrast, coinsurance did not affect the *overall* frequency of children's hospitalizations (90) except for children under 5 (41). Among these younger children, the plans with no cost-sharing requirements for inpatient care showed significantly greater hospital use than the cost-sharing plans (41). As was true for low-in-come adults, the Rand findings also revealed that coinsurance has a substantially stronger deterrent effect among lower income children (i.e., with family incomes up to two times the Federal poverty level) compared with other children with greater financial resources in the HIE.

How is the use of preventive services affected by cost= sharing?[39]

The HIE health plans covered clinical preventive services for asymptomatic individuals in the same way it covered all other health services. Nonetheless, Lurie and her colleagues found that preventive care use in the HIE was well below recommended levels in both the no-cost-sharing and cost-sharing plans (45). For example, across all HIE plans, fully 7 percent of newborns had had no well-baby care in the first 18 months of life; only 45 percent of infants received the recommended three doses of diphtheria, tetanus, and pertussis (DTP) and poliovirus vaccines at the recommended time; only 57 percent of women ages 45 to 65 received a Pap smear during the 3-year study period; and a very low 2 percent of women in this age group had a mammogram for preventive purposes during the same time period.40

When Lurie and her colleagues compared cost-sharing and no-cost-sharing plans, they found that participants in cost-sharing plans were the least likely to use preventive care of any type including immunizations, annual physical examinations, general medical examinations, routine gynecologic examinations, and office visits listed only as well-care visits (45). In particular, coinsurance was found to reduce significantly the use of Pap smears by women ages 45 to 65. While 65 percent of women in this age group in the no-cost-sharing plan had a Pap smear at some point during the 3-year study period, only 52 percent of similar women in the cost-sharing plans had the procedure. Coinsurance was also associated with lower immunization rates among children under 7 years of age. In the 3-year study period, 49 percent of the children under 7 who

38 As noted above, in most of the HIE analyses, children were defined to include anyone under the age of 14. No separate analyses Of adolescents were conducted.

39 For a review of issues related to designing preventive health care benefits, See "Benefit Design in Health Care Reform: Report #l-Clinical Preventive Services" (80).

40 An additional 6 percent of women aged 45 to 65 had a mammogram for diagnostic evaluation.

were subject to coinsurance had at least one immunization compared with 59 percent of similar children in the no-cost-sharing plan.

Even though HIE participants in the no-cost-sharing plan had, on average, an additional one to two physician visits annually, this increased contact with their doctor appeared to have no influence on smoking or dietary habits related to the prevention of many types of cancer and cardiovascular disease (12).