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HEALTH CARE PLANNING:
AN APPRAISAL OF UTILIZATION AND DELIVERY MODELS

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DISCUSSION PAPERS

THE UNIVERSITY OF WISCONSIN, MADISON, WISCONSIN

Preliminary draft
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HEALTH CARE PLANNING: AN APPRAISAL OF
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This research was supported by funds granted to the Institute for Research on Poverty at the University of Wisconsin by the Office of Economic Opportunity, pursuant to the provisions of the Economic Opportunity Act of 1964. The author is grateful to Professors Harold Watts and Arthur Goldberger, University of Wisconsin Department of Economics, for their assistance, and to Elijah White, National Center for Health Statistics, for furnishing special tabulations for this research.

ABSTRACT

Evidence from a regression analysis of data from the National Health Interview Survey is used as the basis of this discussion of the effects of certain demographic variables on health care utilization. Factors expected to increase demand in the future such as the changing age, income, education and residence patterns are currently running into constraints on final utilization produced by supply. Consideration of supply, and in particular the delivery of health services, is the subject of the remainder of the paper which seeks to more forcefully demonstrate the need for public policy to become involved not only with the financing of health care, but with its provision as well.

I. Health Care and the Public Sector: The Alternatives

Three alternatives face policy makers who are attempting to make health care more accessible to the public. Assuming that sufficient services are available for purchase in a given area, the three alternatives are: (1) providing the necessary financing, (2) promoting an efficient and effective delivery system, and (3) promoting awareness in individuals of the potential benefits of medical science. While the three policies are somewhat complementary, they are also competitive. Consequently, it is important to discover what weights should be placed on each.

Other things being equal, and letting only income and wealth vary within an otherwise homogeneous population, the policy decision would be completely weighted in favor of a program providing medical care financing for those who qualify. Such a program might provide payments via established insurance schemes directly to the vendors of services so that a physician would not be able to detect any difference between those patients who can pay for services and those who cannot. In the second alternative, abstracting effective delivery factors is a slightly more difficult task. Various mixtures of services yield different service area radii. In health care, as in many other more recognizable industries, agglomeration provides distinct economies. Thus, a 500-bed hospital might have fewer vacant beds per year than do five 100-bed hospitals operating separately. One large hospital or regionalized system of hospitals may be able to support the cost of radiation therapy, and a heart-lung machine, in addition to the usual laboratory and X-ray equipment, whereas five unconnected, smaller hospitals may be able to support only

five separate labs and five separate X-ray facilities on the same funds. Consequently, merely reallocating a given amount of health care resources to provide wider area coverage may, in fact, reduce the lengths to which such care may go in any one service area. Essentially, the policy question revolves around two competing efficiency criteria. The first is the potential efficiency of scale economies resulting in more specialized and intensive care. Confronting the first criterion is the equally desirable goal of making health care more extensive, thus bringing the benefits of health care services closer to individuals.

Although it is very important, the final policy alternative is the least substantive. Given the financial ability and the accessibility of service, the question is whether or not an individual is sufficiently aware of the choices available to him to make a rational decision concerning the use or nonuse of health resources.¹ While such programs are the oldest of the three alternatives, they appear to have been the least effective. The reasons for this ineffectiveness are complex.

The delivery and financing of all forms of health care is a recent phenomenon in Federal programs. Medical Assistance to the Indigent (Title XIX of the Social Security Act); Medicare (Title XVIII); and Neighborhood Health Centers (NHCs) established as demonstration programs under the Economic Opportunity Act; and existing programs of public health--all meet some obvious, yet ill-defined, needs in the public sector.²

The necessity of public entry into the vacuum created by the existing institutional arrangements for the delivery of health care

through private means will be assumed, rather than debated, here. However, the ill-defined nature of what is meant by "health," "health care," and the "health services industry" is of sufficient importance to warrant a limited discussion.

II. Treatment vs. Health as the Objective

The identification of a product in a service industry such as health care would greatly assist planners concerned with the economics of this industry since it would finally permit the quantification of something which has been abused for some time. If it is to be meaningful, the definition of health must have objective as well as subjective features. Since "health" is to some extent subjective, the preference function for health care may be assumed to be directly related to the individual's awareness of external methods to maintain or improve health, and inversely related to the individual's own ability to maintain his desired level of health. However, such an assumption does not mean that a more aware person will necessarily use external methods to a greater extent than would a less aware person. Greater awareness may, in fact, make a person better able to meet his own needs. Furthermore, such a person may have a higher level of intrinsic health to start with.

Objectively, "health" has been defined in terms of various measures such as morbidity and mortality rates. When these rates are low it is ordinarily assumed that internal and external methods to maintain and improve health are productive. However, an unfortunate

paradox arises when we apply such measures to the productivity of services generally conceded to generate health. Higher rates of morbidity are usually associated with greater output per unit time of certain health resource inputs, such as physicians' services. Thus we arrive at the question: what is the product of health resources? Is it "health" or something more closely related to the converse of health: illness. The latter differs from the former in that illness is a measurable item in terms of days lost or lower productivity resulting from debility. Treatment is undoubtedly related to health, but the two differ significantly in the discussion of the effectiveness of health care. Treatment holds the promise of returning the individual to the healthy state more rapidly than he can return on his own, but it is not health, per se.

III. Utilization and Public Policy: The Need for a Predictive Model

Medicaid, Medicare, and, to some extent, Neighborhood Health Centers, provide financing for the use of health care facilities to a broad group of the poor--public assistance recipients. At state option, Title XIX provides for the medical care payments of those who would qualify for the public assistance categories but for the fact that they have income and/or assets above the cut-off line. Such individuals have been termed the "medically indigent"; that is, they are able to pay all of their usual bills, but have insufficient means to pay for extraordinary medical services.³

When Title XIX became law in 1966 it was estimated that Federal participation during the first year would cost the Treasury about

\$238 million.⁴ The fact that little is known about the level of medical needs of the group aided by this Act manifested itself in the first year of the New York State program. The preliminary estimate of the Federal share was set at \$217 million while the actual cost was \$260 million (or 27.6 per cent more than anticipated).⁵

While the New York program is an outstanding example of miscalculation, such problems are bound to be repeated unless a more accurate method of predicting utilization is designed. For states and municipalities, such open-endedness is neither practical nor favorable for the long-run existence of such a program.

A sound program model must account for the following potential contingencies: (1) the decision by doctors and hospitals to begin charging full price on welfare cases; (2) price increases; (3) increased use of such services as laboratories by practitioners who might have felt constrained before; and (4) increased utilization rates by PA recipients as they become aware of the program and the advantages of medical care. In order to show the great potential benefits that can be derived from more intensive use of existing health care utilization data, the following predictive model looks only at that part of (4) which can be accurately measured.

The structural model of health service usage can be stated as follows:

$$\mu = V + B_0 + B_1A + B_2S + B_3Y + B_4R + B_5E + B_6V + B_7T + B_8H + B_9P$$

V = quantity of service per unit time (dependent variable)

A = age of user

S = sex of user

Y = family income of user

R = race of user

E = education of the head of household in user's family

U = residence in an SMSA (urbanity)

T = region of country

H = health (proxies such as morbidity, debility, and bed disability must be used since "health" is a subjective state.)

P = price of a particular visit

The data used in this discussion of this model are basically from two sources, Census and The National Health Interview Survey (NHIS). As much information as possible was gathered from one source, the volume on physician visits,⁶ and entered into the regressions (see appendix tables). While estimations were made for two reference periods with respect to education and income and education and residence, none proved consistent in regressions and were not used in the analysis.

Several forced order regressions were run on reduced forms of the model to test the relative importance of some of the variables in producing a physician visit.⁷ After accounting for the effects of sex and age, the effects of race, education, income, and residence were tested individually and, where data and theory permitted, collectively. The variables, except for physician visits, were specified as dummies so that published tabulations of the data could be used as raw moments.⁸

In the following results, all regression coefficients were significantly greater or less than zero as indicated by their standard errors (the figures in parentheses below the regression coefficients):

$$1a) V = 6.85 - 1.1S - 2.6A_1 - 1.1A_2 + .18A_3 - 1.4E_1 - .89E_2$$

1963 (.034) (.0186) (.035) (.032) (.033) (.026) (.024)

Separating out the effects of race ($R = 1$ for white, 0 for nonwhite), we note very little change in regression coefficients for 1958, but rather significant changes in the age and education variables for 1963. Apparently the interactions (which are not identified in the regression, per se) between race - age and race - education have become more important in determining how many times a person sees a doctor. By removing the race factor from age, for instance, we see a fourfold increase in the coefficient of persons age 45 plus. The education factor again shows greater strength when race is entered.¹⁰

Substituting family income level (Y_1 = families with income less than \$4,000; Y_2 = \$4,000 - \$6,000; the constant contains families with incomes \$7,000 +) for educational level, the following occurs:

$$3a) \underset{1963}{V} = 5.0 - 1.1S - 2.4A_1 - .87A_2 + .37A_3 + 1.2R - .5Y_1 - .2Y_2$$

(.05) (.019) (.036) (.033) (.034) (.031) (.024) (.022)

$$3b) \underset{1958}{V} = 5.1 - 1.5S - 3.5A_1 - 2.5A_2 - 1.5A_3 + 2.0R + 1.7Y_1 + 1.6Y_2$$

(.04) (.019) (.037) (.034) (.036) (.031) (.022) (.022)

Several significant changes occur in the 1958 regression when looking at income instead of education. The different utilization rates of the sexes is magnified by this addition, as are the age and race variables. Such changes may represent true interactions which are not tested by the regression analysis, or they may indicate poor measurement of the income variable. Since the 1963 data do not demonstrate such wide changes, caution is advised in using the 1958 income variable in future regressions.

Residence was the next variable to be assessed in terms of the model. The test used here was on urbanity ($U =$ residence in an SMSA)

and regionality (T = residence in the South).

$$4a) V = 4.2 - 1.1S - 2.4A_1 - .85A_2 + .36A_3 + 1.3R + .7U - .09T$$

1963 (.05) (.02) (.035) (.03) (.034) (.03) (.02) (.02)

$$4b) V = 5.1 - 1.3S - 2.5A_1 - 1.5A_2 - .54A_3 + 1.6R + .69U - .11T$$

1958 (.045) (.02) (.036) (.033) (.034) (.032) (.02) (.02)

In both instances the coefficients are of the expected direction and magnitude and are approximately the same in both years, indicating a constancy of these particular variables in influencing the quantity of physician visits.

Although the final regression is quite deficient because reliable cross-product raw moments could not be obtained, the results are worthy of comment.

$$5a) V = 4.5 - 1.1S - 2.45A_1 - .89A_2 + .35A_3 + 1.23R - .37Y_1 - .23Y_2 +$$

1963 (.05) (.02) (.035) (.032) (.034) (.031) (.025) (.022)

$$.68U - .02T$$

(.02) (.02)

$$5b) V = 5.2 - 1.5S - 3.5A_1 - 2.47A_2 - 1.5A_3 + 1.9R + 1.7Y_1 + 1.5Y_2 +$$

1958 (.044) (.019) (.037) (.034) (.036) (.032) (.024) (.022)

$$.16U - .35T$$

(.021) (.02)

It is unfortunate that a reliable moment of residence by education was not available because the result with education in the regression would have been more interesting than what occurs with income. As noted in the discussion of regression 3b, income seems to have a very disruptive effect on the 1958 regression. In the 1963 regression, southern residence is seen to fade as a significant variable when income is considered. Thus the regional differences in utilization of physicians, may in fact, be the result of demographic and economic characteristics

such as lower income, higher percentage of nonwhites and less urbanity than in lower availability peculiar to the South.

As more data from the National Health Interview Survey (NHIS) becomes available further tests of a more sophisticated nature should be done. The limited regression results obtained from the two available sets of interviews have the following important components. As the educational level of the population improves, the demand for physicians' services will increase. Other things remaining the same, a one per cent decrease in the number of families in which the household head had less than nine years of schooling may increase utilization rates by about .9 visits per year.¹¹ The fact that the percentage of such families declined from 36.6 in the 1958 survey to 31.2 in the 1963 survey, while individual utilization rates decreased as well, indicates a paradox which can be attributed either to a healthier population, or more likely, to a growing shortage in the supply of physicians which is limiting utilization. The result of the shortage of physicians, which can be labeled the "queuing effect," is part of the delivery problem.

A perceptible shift towards equal utilization rates by the sexes is demonstrated by the comparative regressions from the 1958 and 1963 surveys. While this shift has been noticed by one recent observer,¹² its effect upon utilization has been entirely overlooked by another.¹³ What has produced this shift is not entirely apparent, but it should be recognized so that its significance can be assessed. If the utilization rates of men are rising to the level of women, the shortage of physicians will become more apparent. However, if women are lowering their utilization rates to those of men, the causes should be identified.

Convergence of the race variable could also place a significant strain on supply. When income, age, residence and sex are accounted for, a partial convergence is seen between the 1958 and 1963 regressions (5a and 5b) in which being a white meant (on average) 1.9 more visits per year in 1958, but only 1.2 more in 1963. While the strain would not be great in the aggregate figure of visits (it means only 25 million more visits per year), it could significantly affect the place of visit since supply is particularly short in just those areas where nonwhites manifest their demand.

With respect to age, our regression does not provide the resolution of detail necessary to look specifically at the elderly, the group which has been most affected by public policy. In looking at the regressions it can be seen that age does account for a significant portion of the variation in visits. In part this difference is produced by the proxy effect which age produces for morbidity. Apparently, the oldest and youngest age groups demonstrate the greatest physician utilization rates which drop off precipitously for older children (5-14) and begins a very slow rise after age 14. In general, such a finding has been made from tabulations so that what remains is a greater understanding of the interactions between age and other variables which may add significantly to the understanding of utilization. Differential increases in population in favor of the very young and the elderly would increase utilization to a greater extent than would an across-the-board increase in population, assuming that rates were to remain constant. However, judging from the regression results, age differences are declining. This decline is

especially noted among the prime working-age group (15-44); MAA, and now Medicare, have reduced the economic barrier to many of the elderly. In fact, only in the case of children 5-14 years of age do we fail to see an appreciable change in utilization rates over the period 1958-1963. An investigation into the needs of this group would be very valuable.

The residence variables are interesting, but of no great aggregate consequence. For one, we have shown that a regional difference between the South and the rest of the United States was not significant in the 1963 Survey after other variables, which could account for the differences in utilization, were entered. However, the presence of a higher concentration of nonwhites and low-income families makes the South a likely area for shortages to appear whenever the utilization rates of these low use groups increase.

Residence in an SMSA has meant more trips to the doctor than has residence outside an SMSA. This result may be more of an indication of differences in type of care than in utilization rates. It may be that non-SMSA residents tend to use hospital inpatient services to a greater extent than do SMSA residents with comparable health problems. Since such visits are not recorded, non-SMSA residents appear to have lower utilization rates. Shifts from non-SMSA to SMSA residence will increase observed utilization, but the absolute effects await final evaluation of the extent and focus (core areas versus suburbs) of the shifts. The aggregate data used here cannot resolve the fine points which differentiate utilization in a city. A more detailed study of consumer choices is needed to clarify such differences.

The model presented in this section, even with its limited scope, tells us something more about our health care system than can be gained by an analysis of tables. Some insight has been provided into the contributions made by each of the variables tested in the model to the utilization of physician's services. By comparing to these studies, constancy of the contributions of education and urban residence can be noted while the gradual convergence of sex, age, and race utilization are also established. The value of discussing the income variable is lessened by inconsistencies in the 1958 data and by the changes produced by inflation. Insofar as future research is concerned, the most relevant finding is that, despite the many pitfalls inherent in the National Health Interview Survey, there is a sufficient amount of internal consistency to provide for more intense analysis than is currently practiced.

IV. The Delivery of Care

While the utilization of health care facilities can be partially understood by a model such as presented in section III, a more complete understanding of why utilization rates differ between the races or between urban and rural residence relies to a great extent on an analysis of various delivery systems. The place at which medical services are delivered shows significant differences between whites and nonwhites, even when controlling for income. Seventy-one per cent of the visits made by whites to physicians were in the physician's office; the comparable nonwhite percentage was 57, not controlling

for income. Looking at the lowest income group, 68 per cent of visits to a physician by whites earning less than \$4,000 in 1963 were in his office, while only 55 per cent of the visits by the comparable nonwhite group were there.¹⁴ Use of even more convenient types of visits such as at the patient's home or by telephone were more widespread among the white population.

Despite the realization of the different preference functions that may have established themselves among various ethnic groups, the underlying economic reasons for these differences have not been sufficiently recognized. Consequently, policy 2, which is to provide efficient and effective medical care, must be aimed not only at a cultural problem but at an economic one as well. Certain social groups have been isolated from effective professional health care because the presently constituted delivery system is very inefficient for them.

Since the present physician system was developed around the fee-for-service, those who typically receive free service have not affected the location of these services. Thus, the system was developed to provide the most efficient care for those who directly pay for these services, while those who cannot pay have had to adapt. Those individuals who have the ability to pay are also freer to meet the physical access problem in the delivery of services. They can obtain the kind of care they desire because they are better able to secure private means of transportation, to take time off from work, to have one parent stay with other children, etc. In terms of cost, they see little difference between walking two blocks or driving three miles to see a doctor.

For the individuals not so suitably located and without private means of transport, etc., physical access is significant and can account to some extent for different use patterns. The preceding system also assumes that anyone could go anywhere for treatment whether he can pay for it or not. Such an assumption is not factual. To some extent, the poor often have been unable to obtain care from the private practitioner either because of the physician's reluctance to provide free care, or because local welfare and other institutional practices insist that such cases be treated only at specific locations. By reducing the number of available places--sometimes to one or two in a large city--the accessibility problem is magnified.

A considerable amount of research has been reported on the relative effectiveness of various types of delivery systems.¹⁵ General indications are that the more comprehensive a unit is, the more effective it can be in providing health care.¹⁶ The nature of research into the effectiveness of various delivery systems has been quite extensive, and the indications for public policy drawn from this research have been clear. Overlapping of jurisdictions and fragmentation of services leads only to the study of parts of an individual's health rather than a coordinated whole. Title XIX has as one of its objectives the forcing of this coordination of services through its fiscal leverage. However, housing the administration of health services under one roof, which is one of the objectives of Title XIX, does not solve the delivery problem.

In fact, the second objective of the program, which is to provide for the financing of health care for the categorically needy, may

actually promote the utilization of less effective forms of care. By permitting public assistance recipients to choose a private practitioner who will be paid by the local health service agency, the program reduces the potential it has for encouraging more effective comprehensive units such as OEO's Neighborhood Health Centers to develop. Naturally, such a provision does reduce the problem referred to before as "physical access," but does it reduce the problem effectively?

Now that a PA recipient can almost chose his physician, what has been and will be the result? A program which now says "go anywhere and we will pay the bill" does not mean that there will be a radical shift overnight in the way in which people seek care. To many the hospital clinic will remain the place where friends go or where one can get lost in the impersonal nature of the clinic, while to others the program will be like a new toy in which gross inefficiencies of search and satisfaction will lead to even larger program costs.

From the preceding regression analysis and from studies of family expenditures two facts emerge: low income, low education, and being nonwhite has meant 1) significantly lower utilization rates, and 2) lower cost per visit because of the practice of employing a sliding rate schedule. If the program is to achieve its objective of bringing adequate medical care to all Americans, we should not be surprised if volume of care increases. If the charity system implied by a sliding scale is to be avoided, we should also expect higher costs through higher fees and should not be astounded if some physicians who treat the poor receive large sums from the program as it now stands.

The other side of the problem is more disturbing: now that more individuals are able to demand health care, is there enough to go around? If productivity within the health care industry had not changed between 1958 and 1963, we would have every right to be disturbed by the decline in average number of observed annual physician visits. As it is, this fact has received very little, if any mention.

Productivity in the health care industry has increased, but if an acute shortage is to be avoided, every new practice which adds to productivity should be nurtured. Since the comprehensive unit seems to reduce the time a physician must spend with a patient as well as the time a patient spends in a hospital, it would seem that encouraging the development of such practices would genuinely relieve the pressure on supply, and more important, the potential pressure through new health care legislation as states adopt Title XIX.

V. Summary and Findings

If public intervention in the health care industry is not to place increasing burdens on supply, it must also incorporate means by which the existing supply of health resources can be used more effectively. It is the thesis of this discussion that the physician is the key resource in the health care industry; that utilization rates for hospitals, drugs, and other medical resources emanate from this primary source; that substitutions among these resources is quite possible and indeed is dependent upon the very nature of the physician's practice, i.e. solo, group-specialty, or group-comprehensive. To the extent that one delivery system manifests greater productivity than

another, it should be favored by public policy seeking to avoid the shortening of supply.

In extending financial assistance to public assistance recipients and the medically needy, the Social Security Amendment known as Title XIX ignores the potential shortage situation it encourages because it sets forth no criterion for the creation of services it will pay for. The regression analysis in this paper is indicative of the shortage situation which manifests itself in longer waiting-room lines and higher physician fees. If, as we suspect, physician visits as a quantity are near their uppermost limit in terms of how much time these key individuals will place in their practices, it is necessary for public policy to encourage health care systems which will most efficiently maximize the product of such visits. As population grows, available physician time per person will shrink. In part, this phenomenon is seen in the comparison of 1958 and 1963 health care utilization data.¹⁷

The problem of an effective delivery system is universal, not just one of poverty. However, since the market has made medical resources least accessible to those least able to get to them, it is understandable that shortages would be most acute in poverty areas--be they rural villages or urban ghettos.

As the advantages of medical care become universally available and known, a leveling off can be expected of socio-economic characteristics which tend to produce differences now. The consequence will be seemingly higher utilization rates by the currently disadvantaged and relatively lower rates by the more advantageously situated. Yet

such a result is a sham, for it hides the underlying reason for the leveling--the redistribution of a given pie, and not an increasing utilization of such services by all.

To the extent that available information is interpretable, we must conclude that unless significant steps are taken on the private side, stimulated by the public sector, to increase the productivity of the health care delivery system, the programs to bring adequate care to everyone will wind up providing such care to no one.

FOOTNOTES

¹This question is particularly pertinent in the case of children. Health programs under any policy must be especially equipped to force recognition of the needs of children who may not be able to express these needs for themselves.

²The recent vintage of this first serious effort by the U. S. Government may be seen in the following capsule summary of the history of medical care legislation:

Direct payments to hospitals for the care of public assistance (PA) recipients were not permitted under the matching provisions of the Federal Social Security Act until it was amended in 1950. However, the 1950 Amendment did little to increase the amount of care paid for, since the amount directly paid to the hospital was included within the maximum PA grant permitted an individual to provide for his minimum needs. A payment for hospital care, or even for covering the cost of a prepayment program, would most likely bring the total payment to more than the maximum matching level. Considering the fiscal constraints in most states, necessary medical programs for public assistance recipients were usually the first to be chopped.

Besides the problems of exceeding the matching level, many states and local communities which handled such programs could not even reach the matching level. In essence, the 1950 Amendment aided some PA recipients on the small expense of a physician visit, but came nowhere near meeting the larger expenses of this group.

Administratively, medical assistance was also ineffective in that states arrived at various formulas of state-local relationships. State administered programs were centrally controlled and often developed a "pooled fund" so that the state could make the most of the potential matching funds although agencies to parcel out the funds abounded. Some states favored making the local administrative unit (usually the county) ultimately responsible for medical assistance; these programs were state supervised with even more agencies involved.

Amendments of 1956 were designed to encourage state vendor payments by establishing a separate matching formula based on a small additional amount per recipient in the caseload. The 1958 amendments broadened coverage so that by 1959, forty-three states and districts had plans approved for making medical vendor payments in at least one of the four PA categories.

Additional federal participation for Old Age Assistance (OAA) recipients in 1960-61 brought the remaining 11 jurisdictions into a program of providing for the medical cost of some PA recipients. Moreover, for the first time a program was enacted which recognized the possibility that an individual not qualifying for OAA normally, might be reduced to this category because his income and resources would not be adequate to meet his medical costs. In this manner the Medical Assistance for the Aged (MAA) initiated a new generation of legislation for the financing of medical care.

The history of public involvement in the financing of health services is, of course, much longer than indicated by the above. (cf., Odin W. Anderson, The Uneasy Equilibrium: Private and Public Financing of Health Services in the United States, 1875-1965. New Haven: College and University Press, 1967.)

³ The exact history of the Medical Assistance Bill which became Title XIX of the Social Security Act is somewhat lost in the shadow of the more glamorous Title XVIII (Medicare) legislation. A report in the August 8, 1967 Wall Street Journal claims that the intent of the original proponents of Medicaid was that it would be a substitute for Medicare with only the elderly indigent and medically indigent covered in a prepaid insurance program financed by Federal and state contributions, but controlled by the states.

What is more important than the original intent of the Medicaid proponents is the form in which the bill finally emerged. First of all, if after 1969 a jurisdiction has not adopted a Title XIX plan, no Federal participation in payments for medical care can take place. Secondly, no longer will the amount of private medical care obtained by a PA recipient be tied to a limiting budget of total public assistance. Medical assistance sharing between the state and Federal governments is a separate program administered by the Division of Family Services, Department of Health, Education and Welfare.

⁴ Jerry E. Bishop, "Diagnosis of 'Medicaid'" Wall Street Journal August 8, 1967, pp. 26, 10.

⁵ Ibid. Administrators were stunned by the liberality of the New York program which enabled a family of four with annual income of \$6,000 to qualify. Because of this program, revisions were made to limit the upper bounds of those who can qualify. As it turned out, the New York program cost more than the estimate of what the total program would cost in its first year (\$238 million).

⁶U. S. Public Health Service, National Center for Health Statistics Publication No. 584-B, 5, 6, 19, and Publication No. 1000, Series 10, No. 18, 19, 36.

⁷Variables such as H and P could not be used. In the case of H there were not enough available data to provide the moments, and in the case of price, moments as used here would not be practical. There is another reason for not using price and that is its alleged relationship to income and/or health insurance (i.e., the sliding scale). Rather than risk these complications price was left out of the reduced models.

⁸For a variable such as sex where a two-way division is all that is needed, males were given the value of 1 and females, 0, so that when visits are crossed with males and summed, the moment (sex x visit) will yield the number of male visits. The moment for female visits will always be zero since one of the multipliers is a zero. Three-way divisions were made for education and income, while a four-way division was made for age.

⁹The decline in per person utilization rates can be viewed in several ways. For one, it may indicate a lower desired utilization rate by individuals. This assertion is rejected on the grounds that, historically, individuals have desired more services. A second reason could be economic: the price of services increased at a rate faster than individuals were willing to accept. This assertion is also rejected: the indicator of this price change, the index of physicians' fees in the Consumer price index, advanced at about the same rate it had in the period prior to 1958. A third potential reason for the observed decline would be that more visits are taking place in hospitals. Since the data do not include inpatient hospital care, substitution here would show reduced utilization.

A more plausible reason for the decline in utilization may be an increase in the productivity of a visit. With more sophisticated drugs and better diagnostic equipment doctors may have increased the speed of recovery. More pertinent to the discussion of supply, but also a distinct possibility, is that physicians are reducing their work loads, making patients wait longer for appointments, and thus reducing the number of visits available per unit of time. For lack of a better name, we refer to this supply problem as the "queuing effect."

¹⁰In equations 1a and 1b the age and education variables probably served as proxies for race as well. When race is explicitly placed in the regressions 2a and 2b the coefficients for age and education can reflect more closely their independent effects.

¹¹ A variation of regression 2b separating those in households in which the head has less than 9 years of education from those with 9 or more follows:

$$2b') V_{1958} = 5.7 - 1.26S - 2.4A_1 - 1.4A_2 - .26A_3 + 1.5R - .9E_1$$

$\frac{\partial V}{\partial E_1} = -.90$, or a 1% decrease in the number of E_1 individuals will increase utilization by .90 visits per year. The comparable figure for 1963 was also .90 from the regression.

$$2a') V_{1963} = 4.6 - 1.1S - 2.3A_1 - .74A_2 + .65A_3 + 1.5R - .90R$$

¹² Ronald and Odin W. Anderson, A Decade of Health Services (Chicago: The University of Chicago Press, 1967, Ch. 2, p. 28 and Ch. 5, p. 125). The data for this study were collected independently of the HIS and thus provide an interesting comparison.

¹³ Rashi Fein, The Doctor Shortage: An Economic Diagnosis (Washington, D.C.: The Brookings Institution, 1967). Fein's use of cross-tabulations reduces the degree of insight he can have as to the nature of utilization.

¹⁴ Volume of Physician Visits by place of visit and type of service July 1963 - June 1964, National Center for Health Statistics, Series 10, No. 8 (Washington: U. S. Dept. of Health, Education and Welfare, June 1965). Fig. 12. p. 8 and Table B p. 9. A chi-square test of the similarity of the survey populations' visits indicates that these differences are significantly above the .01 level. Judging from the fairly similar results across income groups, it would appear that race, rather than income, is a greater determinant of where individuals obtain health care.

¹⁵ Cf. President's Commission on the Health Needs of the Nation, Building America's Health (Washington: Government Printing Office, 1953); J. A. Boan, Group Practice, Royal Commission on Health Services (Ottawa, Canada: The Queen's Printer, 1966); Rashi Fein, The Doctor Shortage: An Economic Diagnosis (Washington: The Brookings Institution, 1967) Ch. 5, "Productivity and Organization," p. 94 ff.

¹⁶ William A. MacColl, Group Practice and Prepayment of Medical Care (Washington: Public Affairs Press, 1966) p. 206 refers to the incredible difference among persons enrolled in the Federal Employees Health Benefit Program. According to MacColl the number of non-maternity hospital days per 100 patients covered by Blue-Cross & Shield was 86, the comparable figure was 77 for those in an indemnity plan, and 43 for those enrolled in group practice plans. (Cited by Fein, op. cit. p. 104). See also Richard M. Bailey, An Economic Analysis of Private Medical Practice Organization (D.B.A. dissertation Indiana University, Bloomington, 1963); Isidore Altman, et. al. "The Office Practice of Internists, II Patient Load," Journal of the American Medical Association, Vol. 193, No. 8

(August 23, 1965) pp. 667-72; Herbert Klarman, The Economics of Health (New York: Columbia University Press, 1963) Ch. 6, P. 126 ff.

¹⁷ Preliminary results from the 1967 National Health Interview Survey show the decline in available number of visits more dramatically. Despite an increase in population from 185 to 200 million, estimated physician visits fell from 844 million to 831 million. When this fact is added to the fall in visits occurring from 1958 to 1963 (from 890 to 844 million), the trend is obvious. Despite reasons for increased demand such as higher income, greater education, and increased urbanity, utilization is decreasing. Such a finding adds weight to the implications already drawn.

APPENDIX

The raw moments used for the regression analysis in Section III are presented in the following two tables. The tables may be read in terms of the cross-classification of any two variables: that is, in 1958 there were 16,982,000 males age 5-14 (SA); if the reader would like to know how many females were in this age group he merely subtracts the above number from the total (in the N row) or 33,804,000 to find that there were 16,822,000 females age 5-14.

For variables for which no published tabulations were available estimates were attempted. The most crucial estimation was that of the sum of the squared deviations from the mean for physician visits $\left(\sum_{i=1}^N V_i^2 \right)$. Since visits are not normally distributed, but skewed, the figure chosen assumes a standard deviation of 4.2. Thus it is assumed that no more than about 5 per cent of the population sees a doctor more than 13 times a year, and that roughly 30 per cent never see a physician (outside of a hospital) in a year.

The main effect of the estimation of standard deviation is reflected in the reliability of the regression coefficients. However, the size of the survey sample (115,000 individuals in 1958, 134,000 in 1963) reduces the effect of this estimation and provides a wide margin for error without damaging the findings. Other areas for error exist and are detailed in the Appendixes to each published report.

The major disconcerting factor in the findings is the lack of data concerning the shift in the delivery of care by physicians from

outside hospitals where such visits are measured, to inside hospitals where they are not. From other published sources there are indications that an increasing amount of patient care is being done at hospitals, but we have not been able to estimate the effects of this shift on practitioner's time and availability.¹

¹Ronald and Odin W. Anderson, A Decade of Health Services: Social Survey Trends in Use and Expenditure (Chicago: The University of Chicago Press, 1967) pp. 35-41 relates changing use patterns of hospitals--greater admission rates and longer stays, 1953-63.