NBER WORKING PAPER SERIES

HAS COST CONTAINMENT GONE TOO FAR?

Victor R. Fuchs

Working Paper No. 1776

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
December 1985

Financial support from The Robert Wood Johnson Foundation to the NBER's Program in Health Economics is gratefully acknowledged. The research reported here is part of the NBER's research program in Health Economics and project in Government Budgets. Any opinions expressed are those of the author and not those of the National Bureau of Economic Research.

NBER Working Paper #1776
December 1985

Has Cost Containment Gone Too Far?

ABSTRACT

Current cost containment strategies will undoubtedly result in fewer health services for patients. The analytical framework presented in this paper shows how the effects of reductions in services on health and social welfare depend upon the amount and distribution of services (relative to potential benefit) prior to cost containment and on the size and selectivity of the reductions. Disagreement over whether cost containment has gone too far arises from disagreements about the criterion (health or social welfare), the prior distribution, and how selective the reductions will be. In the long run selectivity will be the key to successful cost containment.

Victor R. Fuchs
National Bureau of
Economic Research
204 Junipero Serra Boulevard
Stanford, CA 94305

HAS COST CONTAINMENT GONE TOO FAR?

Victor R. Fuchs

Cost containment strategies are sweeping through the health care system like fire through parched underbrush. Medicare's prospective payment system based on diagnosis-related groups is leading the way, with health maintenance organizations, preferred provider organizations, state regulatory agencies, and deductibles and coinsurance close behind. The reasons for the changes in health care financing and organizations are well understood.[1] But what about their effects? Over the long run the current revolution in health care finance is likely to change every aspect of the health care system: medical practice, medical education, medical research. The debate over whether cost containment has gone too far has already begun. This paper does not attempt to resolve that debate or to discuss all of the eventual ramifications of cost containment. It does offer an analytical framework for thinking about the direct effects of current policies on health and social welfare.

How Cost Containment Works

Regardless of whether cost containment is sought through competition or regulation or a combination of both, reductions in spending on health care can be achieved in only three ways. First, the producers of health care may be forced to increase production efficiency, i.e., to deliver the same amount of services with fewer inputs. Such gains in efficiency are always possible in every

organization, but it is unlikely that they will prove to be a major source of cost reduction. Even under the old payment systems there was no reward for the inefficiency associated with using more resources for a given amount of services. The inefficiencies that critics pointed to had more to do with what care was delivered than how it was produced.

Second, even with the amount of services and production efficiency unchanged, health care spending can be reduced by reducing the prices paid for inputs. As with efficiency, it is always possible to squeeze input prices a little--to trim nurses' wages and physicians' fees and drug industry profits. But it is highly unlikely that this will be the major source of cost reduction, especially over the long run. In the short run, supplies of inputs may be relatively inelastic and therefore their prices can be squeezed. In the long run, however, nurses, physicians, drug companies, and other inputs into health care must receive competitive compensation or the supplies will not be forthcoming.

The third, and by far the most important way to contain costs is to deliver fewer services. At the most fundamental level, cost containment must mean fewer hospital admissions, shorter lengths of stay, fewer tests and X-rays, and similar reductions across the spectrum of care. Thus, the question about the effects of cost containment can be restated: How will health and social welfare be affected by a reduction in the amount of health services? This question can be illuminated with the help of a few diagrams.

Maximizing Health and Social Welfare

Figure 1a presents a stylized description of the relationship between health benefit and amount of services, defined to include both

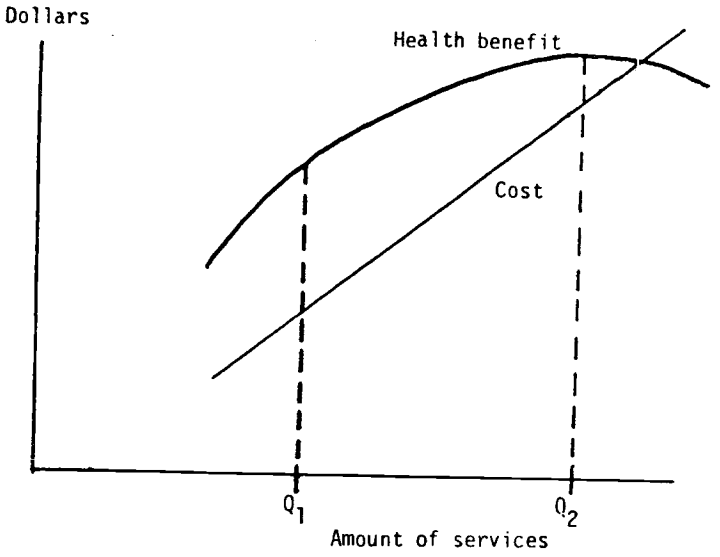

Figure 1a.

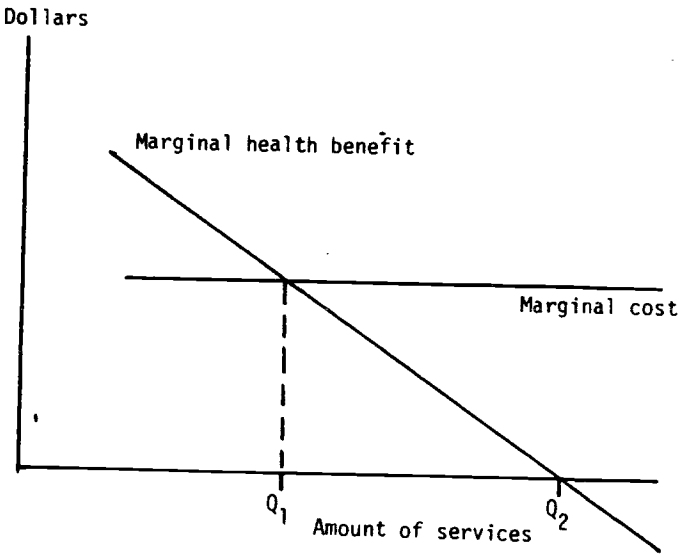

Figure 1b.

Figure 1. Determination of the amounts of services that maximize health and social welfare.

quantitative and qualitative dimensions. For instance, an increase in the amount of care can be thought of as an increase in length of stay in the hospital (holding services per day constant), or as an increase in the number of tests per day, or as any combination of changes in days and tests that results in more services. For each patient the health benefit typically increases as the amount of services increases, but at a decreasing rate. Eventually a point is reached, Q_2, where the health benefit is at a maximum, and additional services do more harm than good. Figure 1a also shows that cost rises as the amount of services increases. To simplify the presentation without undue violence to reality, it is assumed that cost rises at a constant rate, i.e., each additional unit of service adds as much to cost as does the preceding unit. If all the benefits of care are reflected in the health curve, the amount of services that maximizes social welfare is Q_1. If any less care is provided, the benefit would decrease more than the cost; if any amount greater than Q_1 is provided, cost would increase more than the benefit.[2]

The basis for defining the amounts of services that maximize health and maximize social welfare can perhaps be seen more clearly in Figure 1b, which shows the marginal (i.e., additional) benefit and marginal cost curves derived from the total benefit and total cost curves of Figure 1a. The exact shape of the marginal benefit curve will vary from disease to disease and from patient to patient, but the marginal benefit, on average, surely declines as the amount of services increases, and eventually becomes negative. Overall, the linear approximation may not be far off, and greatly simplifies the analysis.

The Effects of Less Care

What happens as cost containment strategies reduce the amount of services? The answer clearly depends on how much is being provided. Any reductions that occur to the right of Q_2 will result in an improvement in health; reductions to the left of Q_2 will decrease health. For social welfare, Q_1 is the critical point. Reductions in the amount of services to the right of Q_1 increase social welfare (because they reduce cost more than benefit); reductions to the left decrease social welfare (because they reduce benefit more than cost). Thus, the effect of cost containment on health may differ from the effect on social welfare; any reductions between Q_2 and Q_1 would simultaneously decrease health and increase social welfare. Both effects, however, depend on the initial distribution of patients by amount of services and on the change in services.

It is reasonable to assume that prior to cost containment different patients are receiving different amounts of services (relative to potential benefit); a stylized description of such a frequency distribution is presented in Figure 2. Some patients are receiving the amount that maximizes the health benefit, Q_2; some are receiving more, and some less. Some patients may not even be receiving as much as Q_1. This distribution and the size and pattern of the reduction in services determine the changes in health and social welfare. Consider the following hypothetical scenarios.

1) Equal absolute reductions

Suppose that cost containment results in a uniform absolute reduction, a, in the amount of services received by each patient. For instance, if amount of services is measured by days in the hospital,

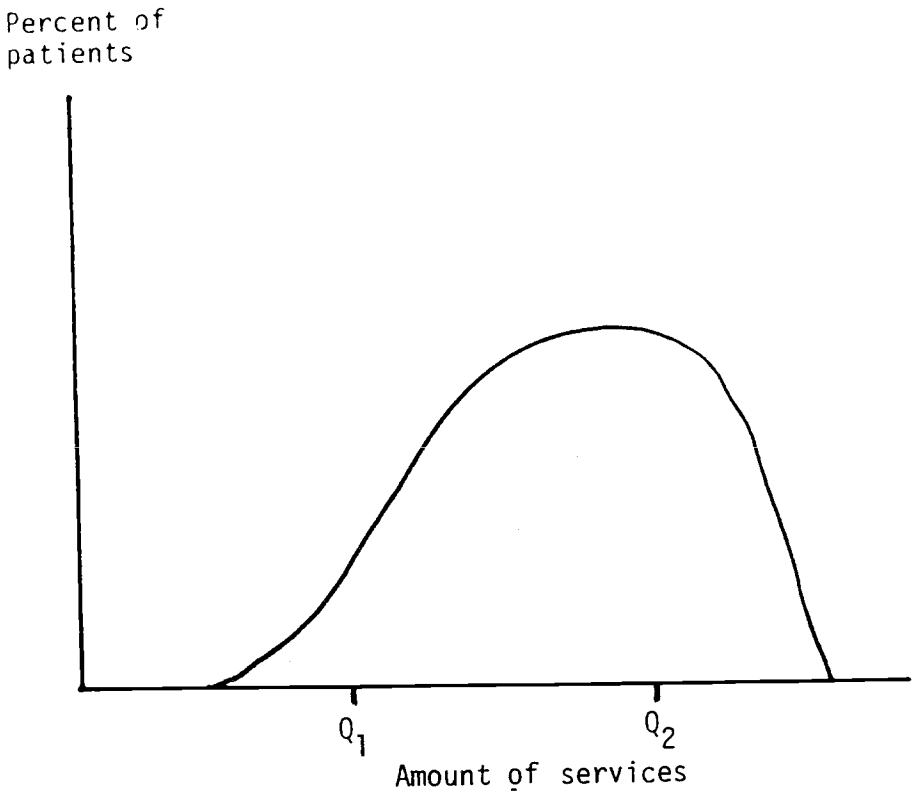

Figure 2. Hypothetical distribution of patients.

each patient has the same reduction of a days. The average effects on health and social welfare will be determined by the size of the reduction, a, and the mean ($\bar{Q}$) of the distribution prior to the change. More precisely, the change in health will be equal to $a(\frac{\bar{Q}}{Q_2} - 1 - \frac{a}{2Q_2})$.[3] This means that health will increase, decrease, or stay the same, depending on whether $\bar{Q}$ is greater than, smaller than, or equal to $Q_2 + a/2$. In the same way, the effect on social welfare will depend only on the relationship between $\bar{Q}$ and $Q_1 + a/2$.

2) Equal percentage reductions

Suppose that cost containment results in a uniform percentage reduction, α, in the amount of services received by each patient. For instance, suppose each length of stay is reduced by αQ where Q is the original amount. In that case, the effects on health and social welfare will depend on the size of α, the mean of the distribution, $\bar{Q}$, and the variance (σ^2) of the distribution. The larger is σ^2, the smaller can be $\bar{Q}$ consistent with a favorable effect on health or social welfare. More precisely, the change in health will be equal to $\alpha[\frac{(\bar{Q}^2 + \sigma^2)(2-\alpha)}{2Q_2} - \bar{Q}]$. This means that health will increase, decrease, or stay the same, depending on whether $\bar{Q}$ is greater than, smaller than, or equal to $2Q_2 \div (1+C^2)(2-\alpha)$, where C equals the coefficient of variation (i.e., standard deviation divided by mean of the distribution). For the effect on social welfare, simply substitute Q_1 for Q_2.

Thus, in the case of equal percentage reductions, it is possible for there to be no decrease in health even if $\bar{Q}$ is less than Q_2 provided the coefficient of variation is sufficiently large and α not tremendously large. Figure 3 shows the $\bar{Q} \div Q_2$ ratio that would result in no change in health for various combinations of C and α. For

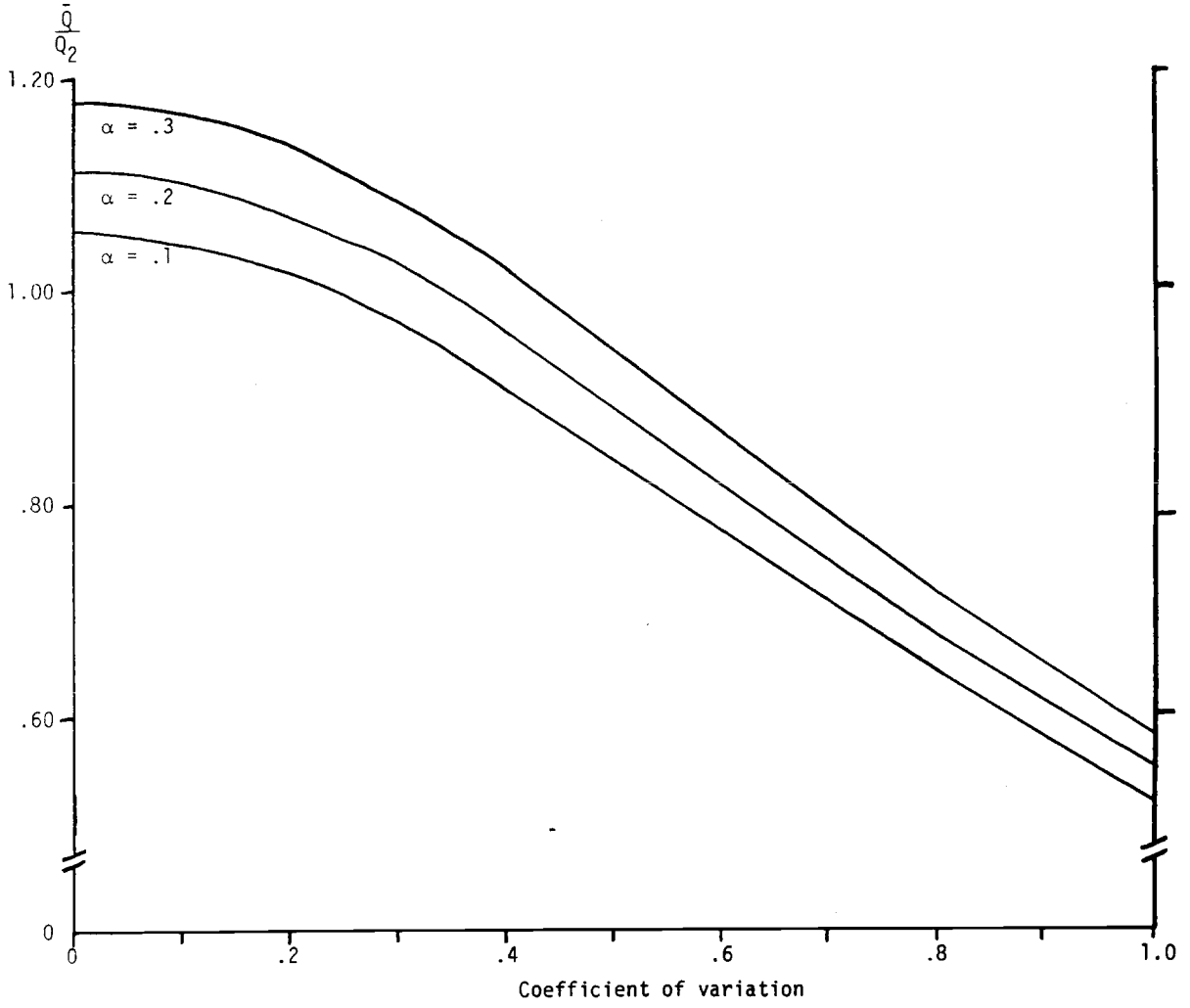

Figure 3. , Values of $\bar{Q} \div Q_2$ that would result in no change in health as a function of C and α.

instance, if the coefficient of variation was .5 and the reduction in care was 30 percent ($\alpha = .3$), there would be no change in health if $\bar{Q} \div Q_2 = .94$. If $\bar{Q} \div Q_2$ were greater than .94, a 30 percent reduction in care would actually result in an increase in health; if it were smaller, health would decrease. By substituting Q_1 for Q_2, Figure 3 can be used to infer the $\bar{Q} \div Q_1$ ratios that would result in no change in social welfare for different combinations of C and α.

3) Unequal percentage reductions

If the reductions are selective; i.e., if the patients receiving more services (relative to potential benefit) experience larger than average percentage reductions, the effects on health and social welfare will be more favorable than those in case 2 for any given values of $\bar{Q}$ and C. Of course, if the reductions are perversely selective; i.e., if those patients receiving fewer services (relative to potential benefit) experience larger than average percentage reductions, the effects will be less favorable than in case 2.

The Policy Debates

The foregoing analytical discussion should help to clarify key aspects of the current debate about whether cost containment has gone too far.

Disagreement over the criterion for judging "too far." Which side a person takes in this debate may depend on whether health or social welfare is the criterion. It is certainly possible (many experts would say probable) that reductions in the amount of services will simultaneously decrease health but increase social welfare because the value of the decreases in health will be smaller than the value of the resources freed for other uses.

Disagreement over the distribution prior to cost containment. Even individuals who agree that health should be the criterion may disagree about the distribution of patients with respect to Q_2 prior to cost containment. If $\bar{Q}$ is substantially to the right of Q_2 (a large amount of services that harm health), then equal absolute reductions in care will not reduce health on average. Some patients will be hurt by the reductions but others will benefit. Even if $\bar{Q}$ is to the left of Q_2 it is still possible for equal percentage reductions to be benign if the prior distribution has considerable variance.

Disagreement over how selective the reductions will be. Even individuals who agree about the criterion and about the prior distribution may disagree about how the reductions will be applied. If reductions are selectively concentrated on those patients who were receiving too much care, the effect will be very different than if the reductions are experienced by all patients.

In the absence of hard data it is not surprising that experts differ in their estimates of the prior distribution and of the probability that reductions will be selective. Those who believe that many patients receive excessive care and that the variance is large can point to the uneven incidence of surgery across geographical areas[4] and to the findings of the Rand Health Insurance Experiment. In that experiment cost-sharing resulted in substantial reductions in the amount of care received by some families, but no major effects on health were observed for either adults or children.[5,6]

On the other hand, a study of the effects of Medicare and Medicaid on utilization of surgical operations casts doubt on the ability of patients to reduce care selectively when faced with less insurance

coverage. Urban nonwhites experienced an increase of 50 percent in their utilization of 11 selected surgical procedures after the government insurance programs went into effect, but the average level of urgency or necessity of the procedures performed on these patients was the same as it was prior to Medicare and Medicaid.[7] If any selectivity had been present during the period of limited or no insurance, the average level of urgency and necessity should have fallen as utilization increased. There is no doubt that deductibles and coinsurance can induce consumers to demand less medical care, but given the complexity of many medical decisions, it is questionable whether consumers know which services to cut back on and which to retain.

Selectivity will become increasingly important as the reductions in amount of care (relative to potential benefit) grow larger. The more selective the reductions, the greater can be the decrease in cost for any given change in health or social welfare. This suggests that the question "Is cost containment being pursued in the best possible way?" may be as important as how far it is pursued. Those strategies such as prepaid group practice that rely on physicians to contain costs are likely to result in more selective reductions than those relying on patients' responses to cost sharing because physicians have more understanding of the potential effects on health of alternative protocols. Moreover, the improvement and expansion of research and education programs designed to increase that understanding will be essential in the long run in order to contain costs in the best possible way.

APPENDIX

Derivation of Results[8]

1. Equal absolute reductions

If the marginal benefit curve is linear and we define the marginal benefit of the first unit of care as 1, then when the amount of care is Q the marginal benefit equals $1 - \frac{Q}{Q_2}$. Therefore, if each patient receives a fewer units of care, the change in health for a patient initially receiving Q units is equal to

$$\int_{Q}^{Q-a} (1 - \frac{Q}{Q_2})dQ = Q - \frac{Q^2}{2Q_2}\Big|_{Q}^{Q-a} = a(\frac{Q}{Q_2} - 1 - \frac{a}{2Q_2}).$$

Since the expected value of any linear function of Q is the same function of $\bar{Q}$ (the mean of Q), the average change in health

$$\Delta H = a(\frac{\bar{Q}}{Q_2} - 1 - \frac{a}{2Q_2}).$$

Therefore, $\Delta H \gtrless 0$ when $\bar{Q} \gtrless Q_2 + \frac{a}{2}$.

For the social welfare calculation, costs and benefits are measured relative to the marginal cost line, rather than the horizontal axis. When the amount of care is Q the marginal effect on social welfare equals $1 - \frac{Q}{Q_1}$. Substituting Q_1 for Q_2 in the above equations gives the change in social welfare.

2. Equal percentage reductions

If each patient receives αQ fewer units (where α is a proportion between 0 and 1), the change in health for a patient initially receiving Q units is equal to

$$\int_{Q}^{Q-\alpha Q} (1 - \frac{Q}{Q_2})dQ = Q - \frac{Q^2}{2Q_2}\Big|_{Q}^{Q-\alpha Q} = \alpha(\frac{Q^2}{Q_2} - Q - \frac{Q^2\alpha}{2Q_2}).$$

Since this function is quadratic in Q, we cannot simply replace Q with $\bar{Q}$ in taking the expected value. The expected value of Q is $\bar{Q}$ but the expected value of Q^2 is $\bar{Q}^2 + \sigma^2$. Thus, the average change in health

$$\Delta H = \alpha[\frac{(\bar{Q}^2 + \sigma^2)(2 - \alpha)}{2Q_2} - \bar{Q}].$$

Therefore, $\Delta H = 0$ when $\bar{Q} = 2Q_2 \div (1 \pm C^2)(2 - \alpha)$ where C equals $\frac{\sigma}{\bar{Q}}$.

Substitution of Q_1 for Q_2 provides the measures for social welfare.

REFERENCES

1. Fuchs VR. Paying the piper, calling the tune: implications of changes in reimbursement. NBER Working Paper 1984. Forthcoming 1986, Frontiers of Health Services Management.
2. The amount Q_1 will maximize social welfare, given the distribution of income in society and assuming that the cost reflects the benefit to society that could be realized by putting the resources to some alternative use.
3. See Appendix for derivations of the analytical solutions presented in this section.
4. Wennberg JE. Dealing with medical practice variations: a proposal for action. Health Affairs 1984; 3:6-32.
5. Brook RH, Ware JE Jr, Rogers WH, Keeler EB, Davies AR, Sherbourne CD, Goldberg GA, Lohr KN, Camp P, Newhouse JP. Does free care improve adults' health? Results from a randomized controlled trial. N Engl J Med 1983; 309:1426-34.
6. Valdez RB, Brook RH, Rogers WH, Ware JE Jr, Keeler EB, Sherbourne CA, Lohr KN, Goldberg GA, Camp P, Newhouse JP. Consequences of cost-sharing for children's health. Pediatrics 1985; 75:952-61.
7. Bombardier C, Fuchs VR, Lillard LA, Warner KE. Socioeconomic factors affecting the utilization of surgicaloperations. N Engl J Med 1977; 297:699-705.
8. I am grateful to Perry Beider for these derivations.