Due to the variability in project function, accompanying infrastructure, and sectoral imperfections, it is impossible to completely list all cost categories to be considered. What can be considered, however, are the conceptual elements of cost change. Four main factors contribute to cost increases: increases in the number of people covered; more units of care for existing recipients, i.e., increased coverage per person; more resource intensive units of care; and more expensive resources. The dilemma most projects face is that more than one of the above factors is present at any given time.

In an article on the variance analysis of cost accounting, Bashan, et al, (1973), provide a simple tool for isolating cost increases from specific factors. The total variance for a product can be decomposed into its components: price variance, quantity variance, and joint variance. For example, the total cost of a project can increase because of an increase in the number of persons covered, an increase in the per person cost of coverage, and some increase due to both of these increases (20).

Economics or Diseconomies of Scale?

In a previous section mention was made of economies and diseconomies of scale. While most planners and economists "intuitively feel" that such economies and diseconomies exist, few empirical works have undertaken the testing of this intuition. Yeon (1979) by employing the techniques of regression analysis, presents one of the few cases of slight economies of scale in maintenance costs. Berry in two separate works systemmatically tackles this question with respect to the U.S. hospitals.

> The statistical analysis does provide insight to the factors affecting hospital cost: hospital services are produced subject to economies of scale but the absolute magnitudes are rather insignificant. (21)

The value of Berry's works lies in raising the possibility of economies/diseconomies of scale and points to an area that requires further investigation and research. While many planners 'intuitively feel' that economies/diseconomies of scale exist with respect to their particular projects, there is no conclusive empirical evidence on this topic.

Problems in the Measurement of Costs

The previous section ended where this section begins -- by noting some of the problems in measuring the costs of primary health care. If one were less than selective, this entire paper could be devoted to stating the problems encountered in cost measurement. The focus of this paper is on both the non-obvious and yet fundamental problems.

Variance analysis was introduced above as a means to identify changes in cost. One shortcoming of this analysis is its inability to answer the question of why the factors in the initial cost model have changed. Thus, the analysis serves a descriptive role in explaining the how, but cannot explain why. One advantage of variance analysis is that it can be used to forecast changes. A problem encountered in cost measurement is that an estimate of predicted cost

is often needed in expanding a pilot project. Here, variance analysis can be a forecast tool (22).

Klarman (1974) tells us that the estimate of costs poses no special difficulties; one merely prepares a budget in terms of the market prices of inputs which may be adjusted by shadow prices if warranted. (23) When it is warranted, how to estimate shadow prices, and what "social good" lies behind the shadow price concept are questions that open a Pandora's box of problems in estimation. If the market price of inputs is not in keeping with their true value, the opportunity cost of the inputs can be used as a proxy for shadow price. In the case of imported goods that are either donated or subsidized, the program cost should include all costs borne by the recipient. If the subsidiary is borne by a foreign nation or agency, then the recipient should not consider these costs in the project calculation (24).

The input-output analysis estimation of costs rests on the assumption of constant returns to scale, i.e., proportional costs, and certainty. The first issue was already addressed in terms of economies and diseconomies. The issue of certainty poses new problems. For example, as the size of a project increases, and it requires greater quantities of inputs, pressure on these input markets may cause factor costs to increase. Conversely, in the early phases of a program, unit cost is likely to be higher than later on, as people become more proficient in their jobs. In this way, people's learning curve (25) causes costs to fall over time. Whether either of these cases exists can be established on a project-by-project basis. The first case, the impact on factor markets, requires large increases in demand for inputs relative to the available supply; the planning phase of the project should incorporate this question. Likewise the second case of decreasing costs can be anticipated given the level of expertise of the personnel.

Time, however, adds a new dimension to the question of certainty for time ushers in new technology, factor price changes not traceable to any one project, changes in patient mix, changes in treatment, and overall changes in the infrastructure. To answer the problems posed above would be to forecast with perfect certainty or accuracy. Instead the planner can focus attention on intertemporal comparison of costs.

A final aspect of uncertainty is the concept of readiness and capacity. Not only are costs the result of activity and the passage of time, but they are also related to volume of activity and the idea of readiness. Attempts to measure such readiness and capacity costs on a per patient basis, Macdonald (1973) are limited to the various procedures of a single health care category that can be finely described. It is not anticipated that this procedure could be adapted to account for the wide range of activities of a primary health care unit. The problem of planned excess capacity does, however, exist on this level also and should be addressed by the planner and future researchers.

The most pervasive problem of cost measurement is described by Berry (1967): "Cost analysis is often complicated by variations in product quality and by inability to segregate costs by product for multi-product firms." (26)

Although this problem of the determination of costs when product-mix and multi-product output is widely documented, the literature is barren with respect to any resolution.

U.S. hospital cost studies provide us with various approaches taken to control for rather than specifically identify multi-product costs. Results indicate that yes, indeed hospital costs do increase with the complexity of services, but there is no clear identification of the way in which costs increase or what factors are responsible. (27)

The approach of most works clearly suits the needs of identifying the sources of cost difference, but requires data sets that are impossible to obtain for primary health care projects. Another technique was adopted by Walker and Gish (1977) in their cost-effectiveness evaluation of mobile and primary health care units in Botswana. Details of all patients were recorded by questionnaire and the details of diagnosis, treatment, and disposal were completed by the patient's doctor. (The purpose of the Walker and Gish study, i.e., a cost-effectiveness analysis, varies strongly from the present task of identifying cost items). Conditions were classified according to the effectiveness of diagnosis and treatment and the outcomes if contact had not occurred were considered. Total costs of providing either mobile or primary health care contact were obtained from the Ministry of Health.

The patients seen by the mobile units were similar with regard to age, sex, diagnostic grouping, and distance traveled for care. Thus, the services delivered were similar by case-mix. Next, the patient outcomes were viewed by the effectiveness of drug and treatment and compared with the effectiveness of the fixed clinics. Comparisons were made along the following lines: average cost per patient contact; average cost per effective patient contact; and average cost per referred patient.

Thus, comparisons can be made with respect to the costs of different programs answering the same needs. In calculating these various per patient costs, Walker and Gish merely divide total cost by the appropriate population number. For projects that address the same function, the Walker and Gish method appears to provide a basis for comparison of cost-effective methods of delivery. It does not, however, clearly address the issue of allocating costs on the case-mix and multi-product basis.

The problem of allocating costs in the health field is really one of allocating costs in the multi-product firm. Economic theory offers a starting point for our thinking (28) if not for application.

The formulation of this costing of the multi-product firm can also be translated into linear programming analysis or input-output analysis. In a previous section, the multi-product concept of health developed by Dunlop (1973) was reviewed. By completing our description of this analysis we see that his linear programming analysis can estimate the total cost for any given activity in any of the health functions. This merely involves allocating the total cost among the several activities (29).