Nursing Home Cost Function Analysis: A Critique

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That the nursing home industry is a creature of public policy is undeniable. The concordance between expansion of public financing programs and growth of the industry in the past several decades is clearly causally related. While some homes enjoy a heavy preponderance of patients who pay their own charges for at least a time, for much of the industry, the market is a monopsony: Medicaid.

Given this fact, relying on market forces to set an equilibrium price for care is inappropriate, if not impossible. Enter reimbursement systems, reimbursement rates, and the need for cost function studies to help set rates of payment which accomplish public policy goals. Policymakers need to know what factors affect costs so they can arrive at reimbursement rates that encourage an appropriate degree of patient access and precisely reimburse efficient operation at an acceptable level of patient care quality. Set rates too high and profits increase above levels needed to call forth adequate supply, or inefficiency increases, or quality levels rise above those appropriate for a publicly subsidized program. Set rates too low and homes drop out of the market, or patients whose care needs exceed the average are denied access through discriminatory admission practices, or quality drops below acceptable levels, or large chains buy up smaller and less efficient producers and eventually complicate the market by changing its ownership structure to oligopoly.

Public policy needs the answers which cost function studies strive to provide. But do they get it from cost function studies? Unfortunately, the answer to that question is often no, for several important reasons.

Foremost is the inherent incompatibility of cost function analysis and publicly subsidized markets. The reason: cost function analysis is intended to identify what the factors required for efficient production contribute to costs. In a state-subsidized market, efficient production may be the furthest thing from reality. That is, as reimbursement system characteristics vary, so do incentives and constraints. And as incentives and constraints vary, so do the production behaviors of firms in the market.

The efficiency assumption that increases in costs reduce profit without affecting revenues may be precisely the opposite under certain reimbursement systems.

While most Medicaid systems long ago constrained the potential for increased profits resulting directly from naive cost-plus retrospective reimbursement, many prospective systems nonetheless permit current expenditures to become the basis for future reimbursement. Taking into account tax advantages and accruing real estate asset values, the potential for delayed profit from nonessential increases in costs is apparent.

Worse yet, for purposes of cost function analysis, the potential for different rates of profit on increased costs is profound for homes operating below, at, or above the reimbursement ceilings employed by many states. Because individual homes face different efficiency incentives and are thus likely to incur different costs, analysis must take into account their varying responses to different ceilings.

At a minimum, homes must be carefully stratified on the basis of the incentives they face from different state reimbursement systems and from different facets and within a single system. Yet this is never an easy or very exact undertaking. Level of care and rate-setting groupings do not adequately control for such system-induced inefficiencies because they fail to consider the ceiling problem.

A second major failing of such studies is their inability—again for a variety of reasons—to specify which input differences affect costs. Chief among these is case mix, e.g., the proportion of patients in a given home or group of homes who require less than, average, or more than average care.

Cost function studies typically include a small number of proxies for differences in case mix, but they are never wholly adequate. Work sampling studies have shown that dependency in activities of daily living (bathing, dressing, transferring, toileting, continence, eating) affects costs significantly, as do number and type of special nursing services and therapies (e.g., special skin care, tube feeding, comatose care). Patient assessment forms only recently introduced in West Virginia and New York capture most or all of these variables, but few other states' data include all of them. The proxies used in lieu of a complete variable set are inadequate—a serious problem when one considers that nursing and patient supply costs may be shown to vary by more than 400 percent across the range of light to heavy care patients when the list is complete. In fact, special nursing services and patient supplies may account for nearly 50 percent of this difference.

It also cannot be assumed that even when such data are available,

they can be adequately incorporated into a cost function analysis in the way in which they actually affect costs. First, there is the problem of change over time if such data are based on admission characteristics. With 53.8 percent of admissions leaving within three months (many of them within a week after admission), one can scarcely assume that those who stay are representatively described by those who enter. Nor can one assume that the debilitated state in which patients are admitted describes their care needs as they partially recover but become long-term stayers.

To the extent that data reflect a point-in-time cross-section which involves surveying current patients rather than consulting chart data on admission status, this shortcoming does not, of course, apply.

Second, to the extent that such data are available, their very presence may reflect a potential source of bias: availability probably reflects use in reimbursement rate setting—a potential reason for the state to understate severity levels when collecting data, and for nursing home personnel to overstate them.

Third, such data must be assumed unreliable to some degree when collected by practitioners and survey personnel, especially across states, given the poor reliability one finds among even highly competent health professionals who have not undergone specific reliability training using a common instrument with standardized definitions.

Finally, even when such data are available and accurate, appropriately incorporating them in cost function analysis depends in large part on the skill with which an analyst handles the difficult problems of specification errors in an environment plagued by multicollinearity (e.g., staffing levels, skill mix, wage levels, and consultant use may all vary with case mix). With the multitude of measures of patient care needs, exploitation of scaling properties and variance summary techniques must be undertaken to keep the specification tractable.

For example, the Guttman scaling qualities of the Katz activities of daily living scale (ADL) are well-known. Of those who need help eating, one can expect about 84 percent to need help toileting; about 91 percent to need help dressing; 95 percent to need help bathing, etc. Why not classify patients by their most severe limitation and use the proportion of each as the ADL case-mix measure, rather than double-counting patients who are dependent in many activities, thereby confounding the analysis?

Classical cost function analysis also turns on another basic assumption which is typically not the case in nursing home cost function studies. That is, one does not usually try to analyze cost determinants of a product until one has been able to define and measure the product. Nothing could be further from the truth of nursing home cost function studies. Differ-

ences in quality of care, patient outcome, and satisfaction levels are not adequately specified or measured in such studies by the weak and limited proxies typically available. Indeed, conceptualizing the meaning of quality in a setting where the usual measures of effective health care— morbidity and mortality—do not apply, represents a challenge yet to be met.

Given the lack of adequate proxies for quality and case mix, one must be concerned about proper interpretation of findings. Can variables such as size, ownership, or occupancy rate be interpreted in the traditional manner? Or do the coefficients for these variables, in part, reflect their correlation with unmeasured dimensions of quality and case-mix variations?

Genuine economies of scale may be overwhelmed by larger homes' willingness to accept (and/or keep) the most severely impaired patients, thereby increasing costs. Similarly, larger homes may be forced to offer higher quality care in order to attract patients. Both phenomena would increase costs in larger homes. Were adequate measures of quality and case-mix variation included in the regression equation, the observed correlation between size and costs might be negative.

Similarly complex is the effect of occupancy rates on costs. Does a positive correlation for high occupancy homes reflect technological inefficiencies which result when a home is operating near capacity? Or is the ability to maintain higher occupancy another reflection of unmeasured quality dimensions or unmeasured willingness to fill empty beds with heavy care patients?

To varying degrees, these problems plague all nursing home cost function studies. One measure of the quality of individual studies is the extent to which researchers acknowledge and deal with them. A second is the measure of success achieved by the effort. As new studies and results are reported, the field will begin to accrue better and better techniques for solving these problems, assuming each new study builds on the success of techniques used earlier. It also seems reasonable to assume that new studies will have more adequate data sets than the earlier ones. Ideally, the specific contribution to policy understanding of any cost function study should be judged by the extent to which the standards of explicitly recognizing theoretical limitations, applying and improving prior, successful techniques, and using increasingly adequate data, are met.

The efforts and contributions to date are effectively summarized in Christine Bishop's excellent synthesis of such studies.[1] She makes it possible to trace the progress in the state-of-the-art in this field. As for the contribution of the studies by Lee and Birnbaum and Caswell and

Cleverley, our purpose in this commentary is to provide the reader with the tools with which to assess them.

REFERENCES

1. Bishop, CE. Nursing home cost studies and reimbursement issues *Health Care Financing Review* (Spring 1980) 47–64.