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LESSONS OF THE NEW JERSEY DRG PAYMENT SYSTEM

by William C. Hsiao, Harvey M. Sapolsky, Daniel L. Dunn, and Sanford L. Weiner

Prologue: In many respects, New Jersey’s state-regulated hospital payment scheme served as a prototype for Medicare’s prospective payment system. New Jersey’s model served, in the political realm, as evidence that prospective payment could be implemented without causing an upheaval in the hospital world. At the time of congressional enactment, of course, there was not a lot of empirical evidence regarding the impact that prospective payments based on diagnosis-related groups (DRGs) would have on the cost of medical care. In this essay, the authors report for the first time the initial phase of an extensive evaluation of New Jersey’s experience with reimbursing hospitals based on DRGs. William Hsiao is a professor of economics at the Harvard School of Public Health. An actuary who has a deep understanding of how insurance works and how the insurance industry operates, Hsiao is a frequent congressional witness and consultant. Hsiao currently is engaged in a closely watched exercise that is funded by the Health Care Financing Administration to develop a relative fee scale for possible use in reforming Medicare’s current physician payment method. Harvey Sapolsky is a professor of public policy and organization at the Massachusetts Institute of Technology (MIT). Sapolsky, whose interest in health policy issues evolved from a fascination with technology (he served on the National Heart and Lung Institute’s committee on the artificial heart in the early 1970s), has delved into a wide variety of subjects over the last decade, including the medical care system of the Veterans Administration, private employer attitudes on health care costs, blood banking, and, most recently, the health effects of common consumer products, which is the subject of a soon-to-be-released book he has authored. Daniel Dunn is an economist who works with Hsiao at the Harvard School of Public Health. Sanford Weiner, a political scientist, is a research associate at MIT’s Whitaker College of Health Science, Technology, and Management.
The state of New Jersey began a major reform of hospital reimbursement in 1980. Included in the reform was the introduction over three years of an innovative method for reimbursing hospitals, the diagnosis-related group (DRG) system, that was intended to alter the incentives offered hospitals in order to improve their efficiency, and thus to reduce the growth in health care expenditures. The DRG component of the reform was widely copied before there was evidence to evaluate its effectiveness. The federal government adopted the DRG system for the Medicare program in 1983. Several state governments and private insurers are using variations to reimburse hospitals for care provided to their beneficiaries. Here we report on the first phase of our evaluative study of the New Jersey DRG experience. With DRGs, fixed prices are established in advance for hospital services, based on patient diagnosis, and paid regardless of the actual costs hospitals incur in providing these services. Because hospitals are allowed to retain the difference between their costs and the fixed prices, they supposedly have incentives to become efficient managers of resources. Hospital administrators will, in this view, have to monitor and redirect physician behavior as well as other resource use in order to lower treatment costs. Those institutions that do not control costs will be unable to compete with those that do.

Our evaluation combines statistical analysis with extensive field interviews and is directed toward understanding both the overall system impacts of DRGs and their individual hospital effects. We begin by describing the origins and goals of the New Jersey system and follow by reporting the results of the statistical analysis. In conclusion, we offer some lessons from the New Jersey experiment for national policy.

The Origins Of Reimbursement Reform

New Jersey has long regulated hospital payment rates. A voluntary hospital budget review operated from 1969 to 1975. This regulation was replaced by a more constraining prospective per diem payment regulation formally known as the Standard Hospital Accounting and Rate Evaluation (SHARE) system. SHARE was in effect statewide from 1976 to 1979, but regulated only Blue Cross and Medicaid rates, which together account for about 40 percent of total hospital payments. In 1980, New Jersey adopted the DRG-based all payer system. Hospitals were phased into this system over three years. Cost containment was but one of several concerns that produced the New Jersey DRG reforms. The coalition that passed the 1978 enabling legislation (which did not mandate or even mention DRGs) had at least two more pressing problems in mind. One was the growth in bad debts that was threatening the financial viability of inner city hospitals. The other was the increasing differential between
Blue Cross regulated payments to hospitals and the uncontrolled charges that private insurers faced. Extending the rate-setting controls to all payers, and incorporating bad debts into the rates, was meant to solve both problems before they became unbearable. Bad debts are now automatically reimbursed and shared among all payers—Medicare, Medicaid, and Blue Cross as well as the private insurers. Similarly, the Blue Cross differential has been reduced from over 30 percent to a more acceptable 8 percent.

The selection of DRGs as the reimbursement methodology was the result of state officials wishing to switch from a per diem to a case-mix-based payment approach and the willingness of the Health Care Financing Administration (HCFA) to support state-managed payment experiments. The intent was to explore the administrative feasibility of using predetermined, diagnosis-related prices for hospital reimbursement. But the test of this approach had to take place within the boundaries of the legislative bargain struck to enact reimbursement reform. That is, not only did the payment system have to insure equity among the payers of health care services, it also had to accommodate the financial needs of hospitals.

The data for this study were gathered through two methods: statistical analysis and interviews. The interviews were conducted with New Jersey and federal officials, insurers, employers, and with physicians and administrators at sixteen hospitals, distributed by size, location, ownership, and management reputation.

The statistical data were derived from the American Hospital Association (AHA) surveys for 1971-83. Our sample includes ninety-two of ninety-seven New Jersey community hospitals reimbursed under DRG-based payment. Five hospitals were excluded due to incomplete data. The hospital variables selected include total expenses, expenses per case, inpatient admissions, average length-of-stay, and current operating surplus.

The Impact Of DRGs On Hospitals

A major item of interest is the overall regulatory impact on hospital costs. Hospital expenses per capita grew from over $80 in 1971 to $130 in 1983, in 1969 constant dollars. Under voluntary budget review, between 1971-75, hospital costs increased an average rate of 8 percent per year. A sharp reduction occurred after 1976 when the SHARE prospective payment system was instituted, the real rate of increase slowing to 2 percent per year. This decrease dropped the New Jersey cost inflation rate for 1976-79 below the levels for the U.S. and the Northeast (3.6 and 2.5 percent respectively). But there was no further marked change in the rate of increase after 1980 when the DRG-based system replaced SHARE, though the New Jersey rate did remain below national and regional levels.
The next task is to determine how the DRG system affected expenses per case. If DRGs did not alter the trend in aggregate hospital cost, they may have reduced the growth in expenses per case. In looking at deflated hospital costs per adjusted admission from 1971 to 1975, the real cost per admission increased at a rate of 3 to 4 percent per year, growing from $620 (in 1969 constant dollars) in 1971 to $735 in 1976. With the start of SHARE in 1976, the annual increase slowed to 2 percent. Since 1980, with the introduction of DRGs, the trend has further slowed, and the deflated cost per admission has remained relatively constant—just over $765 for 1983.

A factor responsible for the slowed growth in costs per admission in New Jersey, 1980-83, appears to be a change in the average length-of-hospital stay. Prospective DRG payment offers hospitals an incentive to promote per case efficiencies. New Jersey hospitals responded by lowering the number of days per admission. The average length-of-stay in New Jersey declined continuously between 1971-76 from 8.6 days to almost 8.3 days. However, when the SHARE per diem was introduced in 1976, length-of-stay began to increase. After DRG-based payment was introduced in 1980, the average length-of-stay dropped sharply. This trend continued through 1983, with the average length-of-stay decreasing from 8.4 to 7.9 days.

The New Jersey trends appear more dramatic when contrasted with regional and national experience, reported in Exhibit 1. Over the period 1971-75, the length-of-stay declined in New Jersey, much like that in the Northeast and the United States as a whole. From 1976 to 1979, under per diem payment, the New Jersey length-of-stay increased, in contrast to the experience elsewhere. Then, under DRG reimbursement, length-of-stay decreased by 2 percent per year, while that in the Northeast and the United States remained unchanged. Thus, New Jersey hospitals influenced length-of-stay in response to the incentives of per diem and per case payment.

The positive DRG impact on cost per admission did not translate into overall savings because of compensating changes in medical practice, that is, admission rates went up to offset declines in length-of-stay. Hospitals have an incentive to increase admissions under DRG-based payment.

<table>
<thead>
<tr>
<th>Years</th>
<th>U.S.</th>
<th>Average length-of-stay</th>
<th>N.J.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971-75</td>
<td>-1.0%</td>
<td>-0.8%</td>
<td>-0.6%</td>
</tr>
<tr>
<td>1976-79</td>
<td>-0.5</td>
<td>-0.4</td>
<td>0.7</td>
</tr>
<tr>
<td>1980-83</td>
<td>0.0</td>
<td>0.0</td>
<td>-2.0</td>
</tr>
</tbody>
</table>
Inpatient admissions in New Jersey increased at a higher rate, 1.3 percent, under per case reimbursement (1980-83) than under the previous system (0.5 percent during 1976-79). The analysis thus far described the trends for all DRG hospitals in New Jersey. However, the trends under DRG-based payment also varied across groups of hospitals. We investigated in particular how the financial condition of hospitals influenced changes in costs and revenues per case with the switch to DRGs.

The New Jersey hospitals in our sample were partitioned into three groups, A, B, and C, representing hospitals that were in surplus, approximately breakeven, and deficit positions prior to DRG-based payment, respectively. The different rates of increase in deflated expenses per case for each group before and after the implementation of DRGs are shown in Exhibit 2. The rate of increase for group A did not change. However, group C hospitals (that is, in deficit position) showed the most marked drop, from 2.82 to −0.29 percent. The decreases for hospital groups B and C are statistically significant. Hospitals in differing financial positions varied in their response to the per case payment system, as measured by the cost per case.

### Exhibit 2
Mean Annual Rate Of Change In Expenses And Revenues In New Jersey DRG Hospitals Grouped By Surplus Position (Per Adjusted Admission, 1969 Dollars)

<table>
<thead>
<tr>
<th>Hospital group</th>
<th>Surplus hospitals (N=34)</th>
<th>Breakeven hospitals (N=34)</th>
<th>Deficit hospitals (N=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 years before DRGs</td>
<td>All years after DRGs</td>
<td>3 years before DRGs</td>
</tr>
<tr>
<td></td>
<td>1.05%</td>
<td>0.99%</td>
<td>1.85%</td>
</tr>
<tr>
<td></td>
<td>1.49</td>
<td>−0.50&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.69</td>
</tr>
<tr>
<td></td>
<td>2.82</td>
<td>−0.29&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.59</td>
</tr>
</tbody>
</table>

<sup>a</sup>Difference between the before and after mean rates is statistically significant at the .10 level of confidence.

<sup>b</sup>Difference between the before and after mean rates is statistically significant at the .05 level of confidence.

We also analyzed changes in revenues per case for the hospital groups. A goal of the New Jersey DRG system was to improve the status of the state's financially ailing hospitals by including reimbursement for uncompensated care. The majority of the hospitals in deficit positions (that is, in group C) served inner city or urban populations, rendering a disproportionately larger share of charity and bad debt care. Following the implementation of the new regulation, the real rate of growth in revenue per case in group C hospitals increased slightly, from 1.6 to 1.9 percent (see Exhibit 2). In contrast, the hospitals in groups A and B experienced a significant decrease in their rate of growth. Revenues per case had grown at similar rates for the three groups prior to DRG-based payment. These
data suggest an overall redistribution of revenues from hospitals in groups A and B to those in group C. Compensation for charity and bad debt care under the DRG reimbursement system, therefore, had a redistributive effect on hospital revenues in New Jersey.

The net effect of the changes in per case revenues and costs under DRG reimbursement is reflected in the hospitals' operating surplus. Exhibit 3 shows the surplus levels of hospital groups A, B, and C, for 1978-83. The surplus positions of New Jersey hospitals in groups A and B remained relatively constant over this period. However, group C hospitals, those previously operating at a consistent deficit, improved their financial health, moving to a surplus level comparable to the remaining New Jersey hospitals. Reimbursement for uncompensated care has contributed to this change.

Finally, payment for uncompensated care may have improved access to hospital services for New Jersey's uninsured.15 Exhibit 4 suggests this has occurred. The uncompensated care portion of total New Jersey hospital revenue has increased during the period 1979-83, from 4.6 to 6.4
### Exhibit 4
**Uncompensated Hospital Care in New Jersey, 1979-83**

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent charity care</th>
<th>Percent bad debt care</th>
<th>Percent total uncompensated care</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979</td>
<td>2.09% (2.62)b</td>
<td>2.96% (1.99)</td>
<td>4.61% (3.20)</td>
</tr>
<tr>
<td>1980</td>
<td>2.16 (2.62)</td>
<td>3.35 (2.12)</td>
<td>5.14 (3.07)</td>
</tr>
<tr>
<td>1981</td>
<td>2.30 (2.91)</td>
<td>3.62 (2.25)</td>
<td>5.50 (3.22)</td>
</tr>
<tr>
<td>1982</td>
<td>2.09 (1.95)</td>
<td>4.15 (2.86)</td>
<td>5.80 (2.84)</td>
</tr>
<tr>
<td>1983</td>
<td>2.07 (1.95)</td>
<td>4.50b (3.50)</td>
<td>6.42b (3.74)</td>
</tr>
</tbody>
</table>

*Standard deviation in parentheses.

bMean percent for 1983 is statistically different from the mean percent for 1979 at the .01 level of confidence.

Note: This exhibit examines the mean uncompensated care portion of gross patient revenue in seventy-nine New Jersey DRG Hospitals.


percent. Part of this change may be due to hospitals making less effort to collect bad debts as well as to improved access for indigent patients.

### Discussion

Prospective payment appears to have moderated hospital cost inflation in New Jersey. When the 1976 SHARE system was initiated, the annual real growth rate dropped from 8 percent to 2 percent (per capita). With the shift to the DRG system, the real rate of increase remained below national levels: the 1980-83 rate for New Jersey was 1.4 percent, compared to 2.5 percent for the rest of the Northeast and 3.1 percent nationally. The New Jersey cost growth, however, was not significantly less under the DRG-based system than under the prior SHARE regulations. The incentives attributed to the DRG concept did not have a differential impact.

Our statistical results do show that New Jersey hospitals experienced a decrease in the growth of costs per case under the DRG system. A major element in this change was the decline in the average length of hospital stay. However, the economies generated were insufficient to offset the rise in admission rates and to produce overall cost savings.

Our analysis found that hospitals in differing financial positions varied in their experience under DRG-based payment. Hospitals in deficit positions showed the greatest change in costs per case and also profited most from reimbursement for uncompensated care. The net result was a strengthening of the financial position of hospitals previously experi-
encing deficits. Payment for uncompensated care also appears to have improved access for New Jersey's uninsured population. Thus, the strongest impact of the new system stems from the bad debt and charity care reimbursement, rather than from DRG incentives.

Information from interviews helps explain why the DRG system was not more effective in controlling hospital inflation than was the SHARE regulation. There appear to be three reasons for the erosion of the expected cost-containment features of DRG-based prospective reimbursement: the political realities of regulation, the constraints imposed on hospital administrators, and the limitations of DRGs as a tool to monitor clinical practice.

**DRG implementation.** DRGs were designed to be homogeneous units of hospital activity to which binding prices could be attached. The expectation of the DRG project managers in New Jersey was that there would be one rate established per DRG for all hospitals in the state. Studies conducted to determine the appropriate rates, however, showed wide variation in costs across hospitals for each DRG. It was impossible to determine how much of the variation reflected real cost differences and how much was due to DRGs classifying unlike patients together. This dilemma left the initial rate projections based on statewide cost averages subject to much criticism by disadvantaged hospitals.

As a remedy, two different adjustments were then introduced into the system. First, the hospitals were divided into three classes by the amount of teaching undertaken, with separate DRG rates computed for each class. Because teaching status correlated with costs, this resulted in higher cost hospitals being compared only with each other. In addition, the DRG rate was redefined to be a blend of each hospital's costs and the average costs of hospitals in its class. The greater the cost variation within any DRG, the more the blended rate for that DRG would reflect the hospital's own costs. Instead of a statewide schedule of rates, New Jersey was left with quite different rates for each hospital, a much less constraining option, with correspondingly weaker incentives.

As the system began operating, New Jersey's regulators found it necessary to narrow the DRG cells still further. Each DRG had length-of-stay trim points (for example, five to fifteen days), outside of which hospitals are paid charges that approximate their actual costs. The trim points were steadily narrowed to increase homogeneity, actions that obviously increased the percentage of outlying cases. By 1982, over 30 percent of all patients were "outliers" paying charges rather than DRG rates. More significantly, these outliers have come to represent nearly half (46 percent) of direct inpatient care revenues. Thus, the net economic incentive produced by DRGs is greatly diminished.

**DRG incentives versus organizational pressures.** The intellectual origins of the DRG methodology are in industrial management. DRGs
were intended to encourage hospitals to behave as businesses with specific "product lines," from appendectomies to hip replacements. With a fixed DRG price for each "product," administrators would discover which of their hospital's products were making money, and they could then work with the physicians who generate the hospital's costs to reduce losses and increase profits.

None of the New Jersey hospital administrators interviewed saw their institutions in these terms. Far from choosing among discrete product lines, they tried to manage the overall budget of an organization subject to multiple cross pressures. They were very conscious of the hospital's status as a nonprofit community organization that should avoid deficits, but found a too visible surplus embarrassing as well. A consistently large surplus inhibits local fund raising, upsets influential community leaders, and makes negotiations over wages and new equipment more difficult, managerial concerns that far outweigh the DRG stress on the achievement of surpluses alone.

What hospital administrators did respond to was the prospect of a budget deficit; it was the overall budget cap of rate setting that was the serious motivator for administrators. They responded, though not by attempting to persuade physicians to become more resource conscious, but with traditional budget-tightening measures: they cut inventories, reduced administrative overhead, and did not replace staff as vacancies occurred. Clinical services, although not immune to scrutiny, were usually accorded the highest priority and therefore were the last to be pared. Indeed, administrators preferred to seek changes in their external environment first, gaining a favorable interpretation of state regulations or an exemption from the rate-setting commission.

The only DRG-based incentives for influencing physicians that comfortably fit with this management style were a few broad rules of thumb that encourage national trends. Thus administrators started campaigns to reduce length-of-stay while trying for increased admissions to keep the beds filled. (Reduced lengths-of-stay save significant amounts of money only if staffing is reduced in proportion. It makes more organizational sense to keep the existing staff occupied with extra admissions.) Similarly, some laboratory tests are now done preadmission or earlier in a patient's hospital stay.

The key organizational incentive in the New Jersey system, then, is the overall hospital budget cap created by prospective rates that extend to all payers. A hospital can increase its revenue by a few percentage points at the margin by increasing admissions or changing the case-mix. But for the first time, the other 95-98 percent of its revenue is fixed in advance each year. Most New Jersey hospitals found meeting the caps at the prevailing rate levels to be only moderately constraining. Yet even this level of constraint, focused where the organization was sensitive—potential
Overall deficits—did produce some change. Thus, as the statistical results indicate, the hospitals with a deficit made the greatest effort to reduce costs while those with surplus made minimal adjustments.18

**DRGs as physician monitors.** A central theme in the DRG literature is that the reimbursement system constrains the hospitals, and the hospitals will then seek to alter the behavior of their affiliated physicians. What is more, DRGs were designed to provide the information about practice patterns that administrators would need to have in order to influence physician behavior. However, hospital administrators have found that DRGs are a very awkward management tool.

Much has been made of the comprehensiveness of DRGs—470 cells for all hospital activity. They were described by advocates as providing the basis for the development of a total hospital management control system. But few New Jersey administrators were inclined to move in this direction. Most chose only to monitor selected DRGs. However, even this more modest effort required the development of a computer system to merge clinical and financial information, a process that on average took two years to produce reliable data.

When the DRG profiles of individual doctors did become available, they picked up anomalies that had little to do with economic efficiency or poor medical practice.19 A typical suburban hospital list of the twenty-five largest money-losing physicians included: the senior surgeons in the hospital, who have had the most genuinely severe cases referred by their colleagues—distinctions not picked up by the DRGs; the chief of psychiatry, because the psychiatric DRGs are among the most heterogeneous and troublesome; the hospital oncologists, who are now employing appropriately new expensive chemotherapy regimens; and hospital ophthalmologists, who are now using artificial lens replacements (a rapidly changing technology) far more frequently than in the base year. None of this physician behavior could be challenged by hospital administrators. The most common examples of overutilization picked up by the system were overuse of laboratory tests (often by residents) and antibiotics, both areas where specific utilization control measures have been discussed for many years.

Thus, the most eagerly awaited DRG impact, a significant shift in administrator-physician relations, turned out to be exceedingly rare. When hospital budgets were in balance, administrators viewed physicians as the key professionals who supply patients and prestige. When the budget tightened it still was much easier to look for reductions elsewhere. Offering exhortations to increase admissions and reduce lengths-of-stay was a more likely administrator behavior than attempts to alter the treatment regimens of physicians.
The Lessons From New Jersey

The attitude of HCFA towards the experiment in New Jersey appears to have changed in recent years. In 1979-80, HCFA's financial and political support was crucial in getting the New Jersey system started. As late as 1983, federal officials, promoting DRGs for use in the Medicare program, cited the New Jersey experience to demonstrate that it was a practical and effective reimbursement scheme. But as the limited impact on hospital costs in New Jersey became clear, HCFA began to stress all the elements in Medicare's prospective payment system that differed from the state program. By the end of 1984, HCFA was trying to cancel the New Jersey demonstration altogether. New Jersey received a three-year extension, by accepting more constraints, only as the program was about to expire.

In fact, both the similarities and differences between the Medicare and New Jersey systems are instructive. Unfortunately, federal officials, in seeking to avoid what they considered the most flawed part of the state system, passed over the elements that work best. We found that the single most notable success in New Jersey was the treatment of hospital bad debt and uncompensated care. By spreading these costs over all payers, New Jersey transformed the financial situation of hospitals that serve the poor. Some hospitals that were persistently losing money are now reporting comfortable surpluses for the first time. This provision is equivalent to a major expansion of Medicaid, though it has little direct impact on the state budget because costs are shared among all payers. In contrast, the Medicare prospective payment system explicitly avoids any bad debt reimbursement. Nothing in the national DRG plan addresses the issue of access to care.

As we described, reimbursement incentives are most relevant for hospitals when they constrain total revenues from all payers. However, national prospective payment applies only to the Medicare program; all other payers will continue to reimburse hospitals in their customary ways. Thus, instead of facing a cap on total revenues, hospital administrators can escape Medicare incentives by shifting whatever shortfalls might occur onto other payers. It is a system that invites cost shifting before cost saving.

What prospective payment has been designed to do is limit the share of hospital revenues derived from the Medicare program budget. As a part of this effort, the various adjustments made to the DRG rates in New Jersey have been severely limited under the national program. Outliers, for example, are limited to about 6 percent of inpatient revenues in the Medicare DRG system, compared to 46 percent in New Jersey. Medicare payments in fiscal year 1984 were 75 percent based on the hospital's own individual costs, but by fiscal year 1987 they will be shifted to stringent national averages (adjusted only for local wage rates and teach-
ing programs). In addition, HCFA froze the fiscal year 1985 rates for 1986, allowing no increment for inflation.

Yet reimbursement schemes are the outcome of political bargaining in Washington, no less than in Trenton. Recall that New Jersey officials introduced all those rate adjustments as an accommodation to the inequities and anomalies produced by the relatively crude DRG groupings. The attempt to run a much tighter system still based on DRGs is politically unstable for two reasons. Each increment of budgetary pressure brings forth lobbyists for hospitals seeking modifications and exceptions. The rate freeze idea, for example, has already produced a counter proposal that the local/national cost blend also be frozen at its current 45-55 ratio, instead of progressing to national rates. Public hospitals, cancer centers, rural hospitals, and those institutions just outside metropolitan boundaries have also staked their claims for special treatment.

But to the extent that prospective payment survives the hospital lobby and actually begins to cut into hospital revenues, it merely increases the attraction of cost shifting to other payers. This situation would then resemble the political context in New Jersey prior to DRGs, with the private insurers pressing for legislative action to reduce payment differentials. We are convinced that the national payment system for hospitals has not yet reached its political equilibrium.

Finally, in taking over the general DRG concept from New Jersey, Medicare also inherited the expectations for product line efficiencies and physician monitoring. We see no reason to expect these will be any more successful outside New Jersey than within. Indeed, hospitals that still derive more than half their revenues from cost-based reimbursement should find economic incentives even less compelling.
NOTES

1. The study is supported by a grant from The Robert Wood Johnson Foundation whose assistance we gratefully acknowledge. Neither the foundation nor our universities are responsible for our analysis.


3. For a description of the SHARE regulation rate-setting methodology, see: Nancy Worthington, Jerry Cromwell, and Gilby Kamens, “Prospective Reimbursement in New Jersey,” Topics in Health Care Financing 17 (Fall 1979): 87-96.


6. The data for the ninety-two hospitals comprise a pooled time series for 1971 to 1983. This time series is used to analyze trend changes in hospital variables before and after New Jersey’s shift to DRG-based payment. The conclusions are also supported by a second, more rigorous trend model using pooled cross-section and time series data. William C. Hsiao and Daniel L. Dunn, “The Impact of DRG Payment on New Jersey Hospitals” (forthcoming).

7. Cost and revenue data are deflated by the AHA hospital input price index to obtain their values on a 1969 constant dollar basis. Due to the national market for hospital supplies and the operation of hospital labor markets, the use of a national deflator should not bias our results. Total expenses and inpatient admissions are measured on a per capita basis to adjust for overall changes in New Jersey population. Current operating surplus is defined as hospital revenue less expenses as a percentage of gross patient revenue. Annual estimates of the New Jersey population were adjusted downward for the service areas of the hospitals dropped from the sample. Source for state population estimates: U.S. Bureau of the Census, Statistical Abstract of the United States (1972-1984).


9. Adjusted admissions, or inpatient admissions plus weighted outpatient visits, were used as the measure of cases for expenses per case due to the inclusion of inpatient and outpatient costs in total hospital expenses.


12. The New Jersey DRG system includes a revenue adjustment for volume changes. However, the measure of variable patient care costs used for adjustment in the initial regulation, for rate years 1980-81, still provided hospitals with an incentive to increase admissions. Since 1981, the measure of variable costs has been improved and the incentive to increase volume within a range is somewhat diminished. See: Jeffrey Wasserman and John Winkleman, “Economic and Financial Analysis,” in DRG Evaluation, Vol. II (Princeton. N.J.: The Health Research and Educational Trust of New Jersey, 1984), 56; and The New Jersey State Department of Health, Procedural and Methodological Regulations (Trenton. N.J.: NJSDOH, 1982), 73-79.
13. Surplus position prior to DRG reimbursement was measured as a hospital's average operating surplus three years prior to DRG payment. The ranges of average surplus for the groups were: group A, +1.5 percent and above; group B, −1.0 percent to +1.5 percent; and group C, below −1.0 percent. The sample includes 34, 34, and 15 hospitals in groups A, B, and C, respectively.

14. Eleven of fifteen hospitals in group C were located in inner city or urban areas compared with sixteen of thirty-four hospitals for each of groups A and B. The mean uncompensated care portion of 1980 total gross patient revenue for the hospitals was 4.4, 4.8, and 6.8 percent, respectively, for groups A, B, and C. The group C mean was statistically greater than the means for groups A and B. Source: The New Jersey State Department of Health, *SHARE Annual Cost Reports, Form E4A, Deductions from Gross Revenue* (1979-1983).


