Determinants of Psychiatric Rehospitalization: A Social Area Analysis

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ABSTRACT: The purpose of this paper is to develop an analytic framework and methodology for estimating the demand for psychiatric hospitalization in state facilities, either new admissions or readmissions of clients from the Community Services Boards (CSBs) of Virginia. The combination of community and organizational factors with inpatient characteristics for the CSBs can help identify pertinent predictors of psychiatric hospitalization. Review of the literature on psychiatric epidemiology shows that the predictors of psychiatric hospitalization can be classified into four major dimensions including community resources, socio-demographic factors, CSB client characteristics, and CSB organizational factors.

It is postulated that the rates of first admissions and readmissions to state facilities are influenced by four dimensions. Furthermore, the variation in readmissions rates is contingent upon previous first admission rates and the average length of stays in state institutions while other conditions—such as community resources and demographics, CSB client mix, and CSB organizational factors—are simultaneously considered. The data were compiled from multiple sources. A path analytic model, using a linear structural relations program (LISREL VI), was validated. After the model was carefully fitted, the estimation equations for the rates of first admissions and readmissions were finalized. The estimates for psychiatric hospitalization, both first- and re-admissions, were made for each of the study CSBs.

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Since the early 1950s, many health professionals have believed that chronically mentally ill (CMI) individuals could be more effectively treated in community settings (Bachrach, 1979). The enactment of the Community Mental Health Centers Construction Act in 1964 was intended to facilitate the development of multiple community-based programs for CMI clients. But the resident population of state psychiatric hospitals declined, the communities to which the CMI patients were being discharged were not prepared adequately to care for them (Bassuk & Gerson, 1978; Freedman & Moran, 1984). The consequent outcry about the policy of deinstitutionalization increased the attention paid to its dilemma.

Most studies examining the factors that inhibit successful readjustment of discharged psychiatric patients in the community have been concerned with either the inadequacy of ambulatory treatment modalities (Tessler & Manderscheid, 1982; Dowell & Ciarlo, 1983) or the lack of community support for CMI clients (Bachrach, 1982; Grusky et al., 1985; Mechanic, 1986; Noble & Conley, 1981). No assessment has been made of the organizational structure and functions of the community mental health centers providing treatment programs for the deinstitutionalized population. Furthermore, psychiatric service research on the performance of mental health centers has yet to develop universally accepted evaluation criteria (Hasenfeld, 1985). There are a variety of ways to establish estimates for institutional care (Klee et al., 1967; Noble & Conley, 1981; Richman, 1983; Warheit, Bell & Schwab, 1974). Warheit, Bell, and Schwab (1974) outline several approaches to needs assessment including: (1) rates under treatment approach, (2) the social indicators approach, and (3) the epidemiological survey approach.

The first approach describes the characteristics of users of psychiatric services and reveals the pattern of psychiatric services rendered in the community. Several early studies using this approach isolated distinctive socio-demographic patterns related to mental health problems and modes of treatment (Cohen & Fairbank, 1938; Pasamanick, 1959). Later studies of psychiatric epidemiology have also used this approach (Langner & Michael, 1963; Malzberg, 1944; Richman, Boutilier & Harris, 1984; Srole, 1961). While the rates under treatment approach has the advantage of being relatively less costly because it relies on data which are routinely collected by service agencies, Warheit, Bell & Schwab (1974) note that it does not allow an investigator to examine those who might receive treatment outside the community. It might be added that this approach is probably not an adequate means for assessing the magnitude of mental illness in the community, as evidence

indicates that demographic differentials in use of institutional psychiatric care exists (Kramer, 1967; Redlich & Taube, 1980).

The second approach to assessment of mental health needs is based upon social area analysis of data compiled from descriptive statistics and public records. For example, the NIMH's Mental Health Demographic Profile Systems (MHDPS) exemplifies this approach. It is based on demographic data obtained from the Bureau of Census and contains many indicators such as social rank, life style, ethnicity, community stability, area homogeneity, and social problems (Goldsmith et al., 1984; Rosen et al., 1975). The MHDPS identifies socio-demographic characteristics that are associated with high risk of psychopathologies in a geographic area (e.g., city or county). According to Warheit, the social indicators approach is hampered by its strong reliance on the community and ecological factors in accounting for the occurrence of mental illness. The validity of this approach has yet to be proven in empirical research.

The third approach is to conduct epidemiological surveys of people to identify mental health problems. Numerous studies have been executed by investigators (Hollingshead & Redlich, 1958; Kramer, 1985; Langner & Michael, 1963; Lemkau, Tietze & Cooper, 1942; Regier et al., 1984). Although the survey approach has the advantage of flexibility allowing investigators to address specific questions, there are problems of reliability and validity associated with the use of survey data. Furthermore, surveys are expensive to conduct on a large scale.

Ideally, a comprehensive community assessment of mental health needs should contain elements of all three approaches so that deficiencies in each of the three approaches may be overcome by an integrated approach. To date, studies of psychiatric hospitalization have not fully used data obtained from different sources to portray a comprehensive picture of the psychiatric care in local and state levels (D'Arcy, Bold & Schmitz, 1981; Kiesler & Sibulkin, 1983; Richman, 1983; Schweitzer & Kierszenbaum, 1978).

Recently, researchers have stressed the need to identify performance indicators reflecting organizational interventions and individual patient characteristics (Kimmel & Stockdill, 1986; Sorensen et al., 1986). The selection of community-wide, population-based performance measures can greatly enhance our understanding of how a health care organization functions in different contexts (Scott & Shortell, 1983).

Organizational assessment should consider a constellation of patient, community, and organizational factors that may influence, either directly or indirectly, the performance of community mental health cen-

ters. To date, studies of psychiatric hospitalization have not used data obtained from different sources fully enough to portray a comprehensive picture of psychiatric care at local and state levels (D'Arcy, Bold & Schmitz, 1981; Kiesler & Sibulkin, 1983; Richman, 1983; Scheffler & Watts, 1986; Schweitzer & Kierszenbaum, 1978). The aim of the present study is to identify pertinent determinants of psychiatric re-hospitalization or recidivism, a performance indicator of how effectively the community mental health efforts treat CMI clients.

This study attempts to overcome some of the deficiencies in previous health services research on mental health problems by combining data from multiple sources. Information on hospital utilization by Community Services Board (CSB) clients, budgetary allocation, and availability of psychiatric services was obtained from the Virginia Department of Mental Health and Mental Retardation (DMHMR). Information on health resources and manpower was gathered from the Area Resources File (HRSA, Bureau of Health Manpower) and the American Hospital Association. Information on Virginia CSB programs was obtained from a survey of agencies conducted by the staff of DMHMR. Use of these data sets has enabled us to develop a social area analysis of psychiatric hospitalization.

AN ANALYTICAL FRAMEWORK

Since the implementation of deinstitutionalization policies, care of mental patients has increasingly shifted from institutions to community-based programs, transforming psychiatric services. Evidence shows that in the last decade the total number of psychiatric patients in state facilities has decreased despite the fact that admission rates have not varied significantly. Examination of the repeat hospitalizations of CMI patients in state facilities illuminates a microcosm of community dynamics at work. In order to understand how community resources, demographic attributes of the catchment area, patient mix, and CSB programs affect hospitalization of CSB clients, an analytical model for explaining the phenomenon of trans-institutionalization of CSB clients is called for.

Review of the literature on hospitalization and institutionalization of psychiatric patients shows that the predictors of hospitalization of the mentally ill can be classified into four dimensions (Figure 1). The first dimension is comprised of the resources available in each CSB area. They include the number of private psychiatric beds, the number and

Figure 1
An Analytical Model of
Psychiatric Rehospitalization of CSB Clients
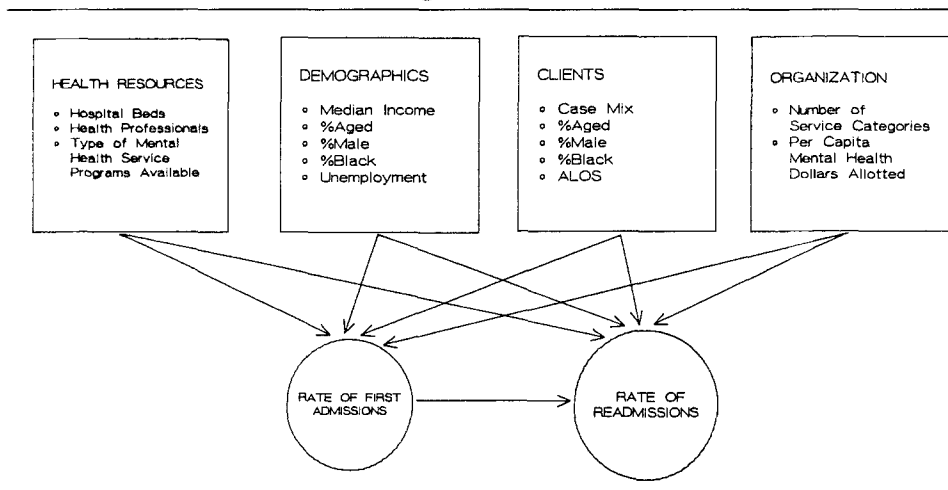
type of medical professionals, and the types of community mental health services provided in the CSB area as well as the financial resources available in the community. The second dimension is the general population characteristics (demographics) of the CSB area. Demographic attributes of the catchment area, such as median income, unemployment, age, race, and gender may influence the type of services to be rendered. The third dimension categorizes CSB clients in terms of their diagnosis (case mix), gender, age, lengths of stay in psychiatric hospitals, and discharge status. The fourth dimension examines the organizational characteristics of CSBs, including per capita mental health dollars allotted for each CSB, how comprehensive the psychiatric care provided their clients is, and the effectiveness of support services rendered.

It was postulated that the rates of first admissions and readmissions to state facilities were influenced by variables specified in the above four dimensions. Furthermore, the variation in readmission rates was postulated to be contingent upon previous first admission rates and the average lengths of stay (ALOS) in state institutions when other conditions—such as community resources and demographics, CSB client mix, and CSB organizational factors—were simultaneously considered. In other words, CSB clients' rehospitalization was expected to be directly affected by deinstitutionalization policy, namely reducing the

average length of hospital stay and each CSB's number of patient admissions to public institutions.

DATA SOURCES AND METHODS

The data reported here were compiled from multiple sources. The definitions and sources of the study variables are presented in Table 1. It is important to note that the social (small) area analysis of psychiatric hospitalization requires formulation of measurement variables at the aggregate level. The unit of the analysis is primarily based on CSB; therefore, data generated from different sources at the county or city level have been consolidated to the CSB level.

In the analysis, two measures of psychiatric hospitalization in state facilities were considered as dependent variables: the first admission rate (per 1,000 CSB population) and the readmission rate (per 1,000 CSB population). In order to avoid mis-specification of temporal sequences of the study variables, we had to use dependent variables that were observed in the period 1982–1985 since most of the explanatory variables in 1980 were available only from public documents, such as U.S. Census Reports and the Area Resources File.

It is important to note that the data used in this study came from the master episodal files of the state psychiatric institutions. However, if psychiatric data from the private sector, third-party payers, or needs assessment surveys of CSB clients of the catchment area populations were available for analysis, a complete model of psychiatric rehospitalization would be possible. Thus, the substitution of psychiatric services between private and public sectors could be assessed. Furthermore, if both public and private statistics on psychiatric services were available, the integrity of an equitable resource allocation model based on need rather than the demand for care could be established. Unfortunately, for lack of access to such data, examination of psychiatric rehospitalization is now restricted to the public sector.

The analytical design used is described as a pooled cross-sectional time series, in that the hospitalization rates were pooled from four study years for each of the forty CSBs in Virginia.[1] Thus, a total of one hundred sixty observations of CSBs is available for analysis. For four CSB areas, the data specific to area characteristics could not be aggregated. Those CSBs were treated as cases with missing values. After merging all the study variables, there were 144 complete observations; sixteen observations were discarded because of incomplete or missing values for some of the study variables.

Two structural equations were formulated to identify the relationship between the selected predictor (exogenous) variables and each of the two dependent (endogenous) variables: first admission and readmission rates in forty CSBs. Only eleven predictors were available from the data base. Preliminary correlation of the structural relationship between the predictors and the dependent variables revealed that only eight predictors were statistically significant.

The model of Psychiatric Rehospitalization (Figure 1) was tested using a full information, Linear Structural Relations program (LISREL VI); since the least squares method does not offer adequate information for determining the validity of the proposed path

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[1]According to Tuma & Hannan (1984), the pooled cross-section and time-series analysis is used to handle both cross-sectional and temporal variation in the estimation of parameters. They further state that if there are several waves of observations, and the underlying parameters are constant over the observation period, and the interval between waves is a constant, one can pool all temporal observations and estimate a single set of parameters.

Table 1
Definitions and Sources of the Variables

Variable Name	Definition	Source/Year
1. ADMRATE	–Number of new patients admitted to state facilities per 1,000 CSB population.	DMHMR/1982–1985
2. READMRATE	–Number of readmissions to state facilities per 1,000 CSB population.	DMHMR/1982–1985
3. ALOS	–Average length of stay of CSB clients in state facilities	DMHMR/1982–1985
4. %BLACKPTS	–Percentage of black inpatients in state facilities	DMHMR/1982–1985
5. %MALEPTS	–Percentage of male inpatients in state facilities	DMHMR/1982–1985
6. %CMIPTS	–Percentage of chronically mentally ill patients in state facilities	DMHMR/1982–1985
7. BED-POP	–Number of hospital beds per 1,000 CSB population.	AHA/1982
8. %AGED	–Percentage of persons 65+ in the CSB.	ARF/1980
9. %BLACK-CSB	–Percentage of black population in the CSB.	ARF/1980
10. %POP-POV	–Percentage of population under poverty level in the CSB.	ARF/1980
11. INCOME	–Median income in the CSB.	ARF/1980
12. NSERVICE	–Number of a variety of CSB services offered.	DMHMR/1982
13. PCMH$	–Per capita mental health dollars allocated to each CSB per year.	DMHMR/1982–1985

Notes:
DMHMR: Virginia Department of Mental Health and Mental Retardation.
ARF: Area Resources File, Health Resources and Services Administration, Department of Health and Human Services.
AHA: American Hospital Association.

model, the LISREL approach was employed. The LISREL analysis of path model provides the goodness-of-fit statistics that can help validate the causal relationship between exogenous and endogenous variables.

Several assumptions have been made in order to derive a final, acceptable causal model:

1. The first admission rate directly affects the readmission rate, assuming that no reciprocal link exists between the two dependent variables.
2. The selection of predictor variables is determined by their theoretical relevance to the dependent variables as well as by their statistical significance. A structural equation was formulated for each of the two admission variables.
3. The residual terms of the two equations are not correlated.
4. The covariance matrix is used to compute the standardized estimates.

After the model was fitted, we obtained final estimation equations for the rates of first admissions and readmissions, using statistically significant variables as predictors.[2]

FINDINGS

Overall Trends in First Admissions and Readmissions

The rates of first admissions to Virginia state facilities in the past decade show a steady decline in the Commonwealth of Virginia. The rates range from 1.98 (1976) to 1.76 (1984) per 1,000 population, with an average 3.0 percent decrease per year. The rates of psychiatric readmissions for the period of 1976–1982 show a declining trend, from 1.38 (1976) to 1.21 (1982) per 1,000 population, but an increase to 1.31 in 1984.

The above observations of general trends in psychiatric hospitalization cannot be adequately explained by the deinstitutionalization policy implemented in 1972. If that policy had been uniformly implemented over the past decade, we would have observed a linear declining trend in admission or readmission rates. In order to fully explore the actual variations in hospitalization rates, we examined the determinants of psychiatric hospitalization among CSB clients in forty CSB areas.

The summary statistics for the selected variables are as follows. The average rate for first admission is 1.92 per 1,000 CSB population. The annual rate ranges from .48 to 3.83 per 1,000 population. The annual readmission rate is 1.44 per 1,000 population; its range is from .40 to 2.60. The average length of stay in state facilities is about 67 days. Black CSB clients account for 30 percent of the total psychiatric inpa-

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[2]Detailed tables can be obtained from the authors.

tients. Sixty-three percent of the inpatients are males, and about half of the total patients are categorized as chronically mentally ill. (CMI).

Characteristics of the CSB areas are as follows. The average bed-population ratio is 4.27 per 1,000 population. The aged population accounts for 10.6 percent of the CSB area population; blacks constitute 17.9 percent. The average number of service categories offered in a CSB area is 5.67. The adjusted per capita mental health allocation for an average CSB per year is $5,203.77.

Determinants of Psychiatric Rehospitalization

Using 144 observations for the period of four years (1982–1985) we performed a series of exploratory analyses of correlations among the study variables. A moderately strong correlation was found between the admission rate and the readmission rate (r = .57). A causal model was validated by path analysis, using LISREL modeling techniques. In the first equation (for admission rates), eight predictors accounted for 51.5 percent of the total variance in first admission rates. Only one variable (bed-population ratio) was not statistically significant. Both average length of hospital stay and median income were inversely related to the admission rates, whereas the other five variables (percentage of black population, percentage of aged population, percentage of chronically ill, per capital mental health dollars allotted, and number of CSB services) were positively associated with the admission rates. For the second equation (for readmission rates), we found that eight predictors accounted for 62 percent of the total variance in readmission rates. However, the majority of variance was contributed by the admission rates (beta = .44). There were four statistically significant predictors of readmissions. It is interesting to note that the ALOS was negatively related to readmission rates, and that the percentage of black population in the catchment area was positively associated with readmission rates. Two CSB organizational variables, the number of service categories offered and per capita dollars allocated to each CSB, exerted a positive effect on the rates of both admissions and readmissions.

Estimation of Hospitalization Rates for CSBs

Regression analysis was carried out separately for admissions and readmissions. The analysis included only statistically significant variables, identified from the LISREL modeling, so that the estimation of admission and readmission rates could be effectively made. In estimat-

ing first admission rates, a time trend variable (fiscal year) was included to adjust for the yearly effect on estimation. To assure the stability of the regression models, both models were tested on both halves of the randomly selected observations. The same variables were statistically significant in both samples for both models. This assures the stability of the models. Since there was no apparent *linear* trend of readmissions in the past decade, the estimation of readmissions did not include the trend variable as a correction factor. Using the following estimation equations, we were able to project the demand for psychiatric hospitalization for each CSB.

Rate of New Admissions:

$$\text{ADMRATE} = .5581 - .0021 \text{ ALOS} + .01110 \text{ \%CMIPTS} \\ + 1.5857 \text{ \%AGED} + .49910 \text{ \%BLACK-CSB} \\ - .0001 \text{ INCOME} + .00003 \text{ PCMH\$} \\ - .0920 \text{ YEAR}.$$

Rate of Readmissions:

$$\text{READMRATE} = .16316 + .99645 \text{ ADMRATE} - .00146 \text{ ALOS} \\ + .01086 \text{ \%CMIPTS} + .03080 \text{ NSERVICE} \\ + .00003 \text{ PCMH\$}.$$

Using already available institutional and population data, the administrative planning bodies in mental health can easily apply the above models in estimating the future demand for the state hospital beds or its equivalent.

CONCLUSIONS

There is a dearth of information about the determinants of psychiatric hospitalization in CSB catchment areas. In this study, an analytic framework and methodology for estimating the demand for psychiatric hospitalization in state facilities was developed.

The combination of community and organizational factors with inpatient characteristics for the study CSBs can help identify predictors of psychiatric hospitalization. When selected variables were included in the equations, they accounted for a significant amount of variation in admission and readmission rates. The findings for the equations for new admissions and readmissions are important for planning and policy making in the management of mental health services in CSB areas.

In examining the estimation of rates of new admissions, it was observed that average length of stay is negatively associated with first time admission rates. This implies that longer lengths of stay in state facilities may prevent more people from being admitted to particular facilities or, conversely, shorter lengths of stay (which is the current trend) will make available more bed days in affected facilities. Thus, more available bed capacity could induce more new admissions to state facilities.

It was also found that a higher percentage of chronically mentally ill clients, elderly, and blacks in a given CSB area is associated with higher rates of new admissions to state facilities. This result concurs with suggestions in the literature that access to the mental health system by the elderly and blacks occurs mostly on the public sector side (Bassuk & Gerson, 1978; Brown, 1985: 62–66). The model also shows that CSB areas that have a higher level of median income experience lower first time admission to state facilities, as first time admissions in those areas tend more to utilize private facilities. Another implication of the first time admissions estimation equation is that mental health dollars per capita tend to be spent on those areas where the need is greater. Finally, over time the use of state inpatient facilities is reduced since new entrants to the mental health system are gradually being shifted to the community care.

Clients admitted to state facilities for the first time stay, on average, about 67 days. Many of these clients are readmitted after their first discharge. The determinants of readmission to state facilities were analyzed by the second equation–rates of readmissions. While sociodemographic factors were found to play a significant role in explaining first time admission rates, they were insignificant in explaining readmission rates for those who had previously been admitted to state facilities. That is, once selected into the state system according to sociodemographic factors, further selectivity for readmission on the basis of such factors does not appear to occur. However, being identified in CMI category increases the chances of clients being readmitted. The number of services offered at the community level in CSB areas was found to have a positive impact on readmission rates. This finding was contrary to expectations. That is, one would expect that as services grow and become more diverse, the community's capacity to minimize the recidivism to state hospitals should be enhanced. However, the findings demonstrated that increased number of services did not produce the expected effect. Furthermore, it was found that the greater the level of expenditure on mental health services in the community, the greater

the rate of recidivism. The impact of these two variables has serious implications for the effectiveness of community based programs in sustaining the recividism rates. Since deinstitutionalization policy was implemented, the relative size of community budgets has gradually increased as has the variety of community based services. Although custodial care shifted toward community based care, the readmission rates did not show any significant change over the past decade and, instead, began to increase. This suggests that the role of community based programs in Virginia needs to be examined. More specifically, it suggests that focus should be on which programs in what settings (communities) are the most successful. Virginia began the deinstitutionalization policy in the mid seventies, nearly 15 to 20 years behind the "vanguard" states such as California and New York. The lessons learned from the pioneering states showed that the total elimination of custodial care was impractical, if not impossible. Thus, at state level, policy makers require tools to estimate the need for institutional care or its alternatives. In this paper, we have presented a tool that can be used to make accurate predictions for such requirement, based on institution and population based statistics at the state level that are available to mental health managers.

The strength of the estimation models emanates from how they parallel findings in other states in which more qualitative approaches are used. Although the models are estimated using Virginia data, variables included in the models are consistent with the qualitatively demonstrated findings in the mental health literature. Our equations thus confirm that state institutions became mental service providers for the poor, black and elderly, as sponsored by Federal Medicare and Medicaid programs (Brown, 1985). Given the consistency of the findings, administrative decision making bodies need to incorporate such tools in order to improve future resource allocation in the public mental health system.

Future research should further the development and the application of the social area analysis by using national data gathered from both public and private sectors in many states. Identifying pertinent predictors of psychiatric rehospitalization will extend understanding of organizational performance in the community mental health field. To assess the performance of CSBs, it is imperative to follow up discharged patients from state institutions and to trace their utilization of both private and CSB-based services in the community. The utilization data can be further aggregated into small areas to assess the potential reciprocal relationship between the use of private and of public psychiatric services. The need for these data and their analysis has already

been articulated and is evident in the NIMH's research initiatives to stimulate psychiatric services research. Until such data are available and have been analyzed, we cannot adequately explain why the variations in psychiatric rehospitalization exist in different community service areas.

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