THE APPLICATION OF LINEAR PROGRAMMING TO LOCATING MENTAI HEALTH OUTPATIENT FACILITIES

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ABSTRACT: A model for locating public mental health outpatient facilities must incorporate accessibility factors within budgetary constraints. The model should also include an opposition factor to spread risk, both real and perceived, in an equitable fashion. The size of the facilities must be small enough to effectively minimize opposition to their construction, yet large enough to allow economics of scale to operate. Influences outside the model, such as education and community preparation, are also discussed.

Beginning in the 1960's there has been a trend away from large state mental institutions towards smaller, community-based outpatient facilities. The larger facilities were seen as dehumanizing and a violation of the patient's civil rights. This trend gained momentum at a rate that many states and municipalities found difficult to match in terms of planning and implementation. The media fanfare over any incidence of opposition prompted many politicians towards the easiest route, which was to locate facilities where the resident population had little political sway. What transpired was a clustering of mental health outpatient facilities in low-income, often minority, areas, or the surreptitious opening of facilities in less visible locations where their presence would not be quickly noted. Many of these receiving neighborhoods are finding they have a voice and are using it to demand more equitable treatment in the placement of less desirable public facilities. The adaptation of a noxious facilities model can provide the base for planning the location of future facilities which would spread the perceived risk in a more equitable manner among all populations.

RATIONALE

Do people really object to having a mental health outpatient facility located in their neighborhood? Opposition has been shown in divers studies to be minimal; support seems to be the norm. Several studies cited in Taylor (1989) bear this out. Rabkin et al.[1] found that a large majority of their New York respondents would not object to having a mental health facility near their home. Dear and Taylor[2] found that in Toronto there were different percentages of opposition depending upon how close the facility would be to the respondent's home: 12% at seven to twelve blocks; 24% at two to six blocks; and 39% on the same block. A pattern of distance decay is clearly evident. They noted, however, that away from the center of the city there was a strong distance-decay in tolerance for mental health facilities.

[1] J.G. Rabkin, G. Muhlin & P.W. Cohen. "What the neighbours think: community attitudes toward local psychiatric facilities. Community Mental Health Journal, 1984, 20:304-12, cited in Taylor 1989.

[2] M.J. Dear and S.M. Taylor. Not on our street: community attitudes to mental health care, (London: Pion, 1982), cited in Taylor 1989.

There has typically been more intense opposition when a suburban location was proposed (Taylor 1989). The opposition also changes with the type of facility and anticipated clientele (Taylor 1989).

The lavish media attention given to any overt opposition movement may be responsible for the perception of a high volume of opposition (Taylor, 1989). A camera crew with an articulate newscaster can easily exaggerate the level of opposition to any particular proposed siting. However, even if only a small minority opposes the proposed siting, easy acceptance of the location plan may not be forthcoming. That small minority can influence the response of the community, especially if they have financial or political clout within the community and if the non-opponents remain silent (Taylor 1989).

Wolpert, et al. (1975) in their earlier study presented a somewhat different picture. They found that community opposition accompanies candid disclosure of plans for facilities, and that the officials seeking to site mental health facilities anticipated this resistance by expeditiously locating facilities in areas of low income and deteriorating land use or by using inconspicuous facilities, such as store fronts, converted homes, office buildings, and mobile units (Wolpert et al. 1975). The result is that certain communities are threatened by saturation of facilities, while most American communities are not exposed to the mentally disabled (Wolpert et al. 1975).

Cheung (1989) found in her study of the Shatin District in China that residents there accused the government of dumping the mental patients on them without consulting them beforehand. This seems to be the situation here as well. Community preparation and education early on in the planning process may help to alleviate some portion of the opposition. Greater participation of the neighborhood itself in the planning and implementation of facilities may be another method of reducing community resistance. Another possibility is to apply a modified model for noxious facilities to maximize accessibility while limiting the size of the facility so as to minimize the perception of risk by the hosting populace.

Well, isn't it the underprivileged who need the facilities most? Wolpert et al. (1975) citing Cobb[3] noted that alcohol and drug addiction are not very discriminating as to class or status. Neither is mental retardation nor various other forms of mental disability. Wolman,[4] cited in Smith (1977), found that over 80% of the population experiences some degree of mental disability at one time or another, and over 25% have serious symptoms. Shapiro, et al. (1984) in their study of three sites of the NIMH Epidemiologic Catchment Area program found that over a 6-month period, all persons averaged 2.71 visits per person in New Haven and Baltimore and 2.53 in St. Louis, and that the percent of these visits that were made for mental health purposes was 25.2, 20.3 and 15.7 for New Haven, Baltimore, and St. Louis, respectively. It is apparent that mental disability is everyone's problem and should be shared equitably.

Do mental health outpatient facilities pose any real risks? A recent program by the federal government to release persons into the community who are "not guilty by reason of insanity" and to assign these persons to outpatient facilities does confirm that there are some real

[3] C.W. Cobb. "Community mental health services and the lower socio-economic classes: a summary of research literature on outpatient treatment (1963-1969)," American Journal of Orthopsychiatry, 1972, 42:404-14.

[4] B.B. Wolman. Call No Man Normal, (New York: International Universities Press, 1973).

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risks involved in the presence of such facilities (Lamb, et al.). In a 5-year follow-up study of 79 persons who were referred to court-mandated community outpatient treatment in California, 32% were arrested at least once during the 5-year period. In states, such as Oregon, where adequate security from mentally ill offenders was provided, the risks were minimal (Lamb, et al.). It would seem that the larger the facility, the more unwieldy the management and the greater the risk of an unsatisfactory occurrence. When dealing with noxious waste there are technical safety features and alternate emergency features which can be installed. When dealing with people, the variations are infinite and the potential for a "malfunction" increases with each addition.

MODELLING THE PROBLEM

One model that could be adopted for use in locating mental health outpatient facilities is the Ratick and White (1988) model for locating noxious facilities (the "CAC Model"), which analyzes three location objectives: minimizing the total cost of meeting a prespecified regional demand, minimizing aggregate opposition related to scale, and maximizing the minimum equity index for any site that is to host a facility. Although created to primarily handle the problem of toxic waste and similar noxious substances, it can be used with minimal modification to optimize the location of mental health facilities in a more equitable fashion. The CAC model uses a three-part composite objective function which (1) minimizes the cost if a facility of size k locates; (2) minimizes the population opposed if a facility of size k locates, counting a population each time it falls within a risk radius; and (3) maximizes the size of the smallest equity outcome measure for a given location. The CAC model does not, however, specifically incorporate a distance decay function, which could increase the number of possible sites and/or sizes of facilities. This would require transforming the population opposition objective function (equation 2) into a composite function, using differing values for o, where the scale of opposition factor is stepped. One such function, which might be adjusted to fit this scenario, is the Alternative Formulation for the Relative Benefit Maximal Covering Problem of Church and Roberts (1983); only here we would be using it as a minimization of opposition function rather than a maximization of coverage function. The constraints to the CAC model are (1) the capacity of a facility of size k which locates must be greater than or equal to the total demand; (2) each site has only one facility; and (3) the equity outcome index constraint, which allows that if a site is chosen as a solution, then the equity outcome index for this site is the sum of the number of other sites that are also chosen to have a facility and which do not include this solution site in their effective risk radius. The equity outcome index for this site will not be included if no facility is to be located there.

In applying this, or any other model, to the location of mental health outpatient facilities, a sampling of the population to determine an approximation of the level of opposition for the given area where facilities are being located would be needed, especially with respect to suburban locations as opposed to central city locations, as a change in the distance decay function has been shown to exist (Taylor 1989).

CONCLUSIONS

Government regulations and public outcry have necessitated the reduction of large institutions for the treatment of the mentally ill and have placed a greater burden for their treatment on community-based services. In the past, the locations of these facilities has been a matter of expeditious implementation in areas where the populations have had little political or financial influence or in locations where their visibility was masked to prevent the local population from learning of the facility's presence until after the facility was in full operation. Although active public opposition to siting facilities has not been extreme, even moderate levels of opposition can severely hamper the ability to site facilities. Applying linear

programming models used for noxious facilities siting could offer a solution to equitably locating mental health outpatient facilities and, by limiting the size of facilities while achieving a size large enough to be financially operable, and spreading the risk to several communities, so that no community sees itself as being overburden with the problem, opposition could be lowered to the siting of such facilities, presenting a preferable solution for facility planners.

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