Distance and the Use of Mental Health Services

GARY W. SHANNON, RASHID L. BASHSHUR, and JOSEPH E. LOVETT

University of Kentucky;
University of Michigan;
Natural Health Forum

INTEREST IN THE RELATION BETWEEN DISTANCE and the use of health services is long-standing and wide-ranging in medical care research (Shannon, Bashshur, and Metzner 1969). Nowhere, however, is consideration of the association more explicit and central as within the mental health care sector. Our purpose here is to review and assess the research literature on the relation between distance and use of mental health services and to suggest possible extensions and revisions of the distance concept that may be beneficial in future mental health services research, planning, and policy development.

Though the importance of many other variables to the use or nonuse of mental health services has been documented, much mental health care research and policy has revolved around considerations of distance. Explicit references to the important effects of distance on the use of mental health services extends back over 170 years in the literature. The establishment, location, and use of long-term care institutions and, more recently, community clinics and outpatient mental health facilities have been the focus of "distance" research. Owing to the broad concern with distance in mental health services research, we limit this article to the effects of distance on use of service and

The Milbank Quarterly, Vol. 64, No. 2, 1986

attendant implications for understanding the distribution of mental illness. The historical perspective adopted here demonstrates not only the continuity but also the pervasiveness of interest in the distance variable.

Early Concern and Jarvis's Law

With certain exceptions, community mental health care was relatively unknown until the mid-twentieth century (*Hospital and Community Psychiatry* 1976; Galt 1855; Sibbald 1861). Early assessment of distance and the use of mental health services, therefore, focused on the asylums. Early in the nineteenth century, Tuke (1814) reported that problems of long-distance travel were instrumental in the establishment of an asylum near York, England, by the Society of Friends to facilitate treatment of the mentally ill as well as patient visiting by friends and family. It was reported that the distance to be traveled precluded visiting a woman member of the society committed to a distant asylum and, under such circumstances, "death put a period to her suffering" after a short time. Family and friends believed her death might have been averted if they had been able to visit her. In this early instance, the long travel distance to the extant facility prompted demand for and, subsequently, establishment of a more proximal facility—The Retreat. Even today the location of long-term facilities relative to the residences of friends and family members and the implication for visiting and quality of care remain a serious concern (Cross and Turner 1974a, 1974b).

Records available from the seventeenth century "psychiatric" practice of Richard Napier, alias "Sandy," document the importance of distance to mentally disturbed patients seeking his help and advice in Buckinghamshire, England (MacDonald 1981). Of greater importance to the present discussion was the emphasis placed on the direct association between distance and use of mental asylums in the mid-nineteenth century. The first systematic analysis of this association was conducted by Edward Jarvis (1852), a Massachusetts physician, who observed "that insanity has increased in prevalence of late years, to an alarming extent, and that the number of lunatics, when compared with the population, is continually on the increase." Available data at the time certainly suggested precipitous growth in the number of insane—at

least insofar as the number of hospitalized mental patients is concerned. For example, the number of patients in the Ohio State Lunatic Asylum near Columbus increased over 400 percent from 1839 through 1850, from 64 to 328 patients. At the Western Virginia Asylum at Staunton, the number increased more than 800 percent in 22 years, from 38 cases in 1828 to 348 in 1850 (Jarvis 1852). Similar increases were observed in other asylums during this period. Noting this trend, Jarvis initiated an analysis of the relation between travel distance and admission to asylums—an inquiry that would go far in debunking but not eradicating prevailing notions of the "effects of social progress on insanity," (Jarvis 1852; Rothman 1971) which were supported by data purporting to demonstrate rural-urban variation in prevalence rates. The significance of Jarvis's work with regard to distance and utilization warrants a closer examination of his observations and conclusion.

Jarvis's first inquiry into patterns of admissions to asylums was conducted to support his contention that, rather than building a single, massive hospital in a central location, a state's population would be better served by a series of smaller hospitals built in different regions (Jarvis 1850). He argued that so-called "state" hospitals were, for all intents and purposes, regional in terms of the areas served. In support of his argument, he analyzed patient record data from "lunatic hospitals" of the period, focusing especially on the county of each patient's residence. For instance, in New York State, the county of Oneida (site of the asylum at Utica), sent 2.8 per 1,000 of its population to the asylum, whereas counties within 50 miles of Oneida sent 1.6 per 1,000, counties from 50 to 100 miles away sent 1.2 per 1,000, and those more than 100 miles away sent 0.7 per 1,000. At the Kentucky Lunatic Asylum located in Fayette County near Lexington, patients were admitted from the host county at a very high rate of 11.2 per 1,000 residents; in six contiguous counties the admission rate was 3.2 per 1,000 people. With successive distances the county admission rate decreased to 1.6 per 1,000 for those up to 70 miles away; 0.8 per 1,000 for those more than 70 but less than 150 miles away; and, finally, for counties more than 150 miles away the admission rate was 0.6 per 1,000 residents (Jarvis 1850). From these empirical observations, Jarvis determined that it was, as he put it, "manifestly absurd" to conclude that insanity was four times more frequent in Oneida than in the more distant New York counties and 18 times more frequent in Fayette as in the most distant

counties of Kentucky "in proportion to their respective populations." Supported by similar observations from other states, he was led to a seemingly simple and straightforward conclusion: "The people in the vicinity of lunatic hospitals send more patients to them than those at a greater distance" (Jarvis 1852). This is the essence of what is known today as "Jarvis's Law" that asserts the existence of negative association between the likelihood of being admitted to a mental health facility and the distance of the person's residence from the facility. And a recent review and statistical assessment of Jarvis's work corroborates his finding (Hunter and Shannon 1985). Early and, apparently, independent support for Jarvis's conclusion is found in a study conducted in Denmark (Selmer 1879). Here, substantially higher admission rates to a state hospital at Risskov were observed from areas near the hospital than from those more distant.

Geographical Distribution of Insanity

Jarvis's and Selmer's observations had important implications for understanding spatial patterns of insanity since many studies of this phenomenon have been based on admission rates to mental hospitals and other facilities. Most late nineteenth and early twentieth-century studies largely neglected or ignored their findings, however. In one instance, population data from the United States census of 1880 and the number of institutionalized mentally ill reported therein were used to determine geographical variations in insanity. Using these data the highest "prevalence" of insanity was found to occur in the Northeast—New England and the Middle Atlantic states. This prevalence steadily decreased, with limited exceptions, in all directions from this "core" area (White 1903). Since prevalence as measured by the number of hospitalized insane was not apparently related to geographically variable climactic conditions, it was argued again that insanity was related directly to population density, the growth of great cities, and the concomitant "stresses incident to the progressive civilized state" (White 1903). There was no attempt to associate the substantially lengthier history and the larger and greater number of asylums in the northeastern states with the prevalence rates as measured.

An early twentieth-century study of insanity in Ireland also drew conclusions based upon the number of the insane in county asylums

and workhouses (Dawson 1911). No appreciable relation was recognized between the prevalence of insanity and population density, but its distribution tended to prevail in agricultural counties and was closely related to "pauperism which also prevails in the rural districts." Again, the relative distribution of facilities for the insane was not considered, nor were "figures showing the numbers [of insane] outside institutions, which will appear in the forthcoming census returns." The latter was considered by the author to be the less regrettable since "such numbers possess . . . in my opinion, very doubtful value" (Dawson 1911).

Public and private mental hospital data continued to serve as the sole source of information for later studies on the epidemiology of insanity. In 1926, for example, using first admissions to public and private hospitals in Massachusetts, New York, and Rhode Island, it was determined that insanity was not on the increase—at least since 1912 (Elkind 1927). In another study, using average annual rates of first admissions to state hospitals for the civil and criminally insane as well as data on residents of licensed institutions, it was determined that 57 of every 1,000 males and 56 of every 1,000 females in New York City "may be expected to be treated in an institution for mental disease in New York State at some time in their lives" (Malzberg 1937).

Though neglected in the majority of studies, the distance or "convenience factor" was implicitly involved in a 1936 study of the "alleged increase in the incidence of the major psychoses" (Elkind and Taylor 1936). As usual, this study was based on hospital admissions, but it was limited to New York and Massachusetts since only these two states met the qualifications of having "plentiful hospitals" and hospitals "conveniently located to individuals who need them" (Elkind and Taylor 1936). A similar rationale was used in a later study of the prevalence of mental illness in New York State (Tietze 1943). Here, it was suggested that admissions to mental hospitals may be considered a fair measure of the incidence of psychosis only in communities with an "adequate and well-established system of mental hospitals." Nevertheless, rates for various psychoses were determined on the basis of first admissions to hospitals.

In Faris and Dunham's (1939) classic study of *Mental Disorders in Urban Areas*, it is stated that the distribution of paranoid and catatonic schizophrenia, manic-depressive psychoses, and other mental disorders in Chicago were based on "cases of mental disorders, as plotted by

residences of patients previous to admission to public and private hospitals." The authors were apparently unaware of the potential significance of the fact that "all cases of mental disorder in Chicago that are cared for in public institutions are first brought to the Cook County Psychopathic Hospital," (centrally located at Polk and Wood Streets) "where they are held for a week or more for examination" and then, if deemed necessary, "committed to one of several state institutions in the vicinity of Chicago" (Illinois Society for Mental Hygiene 1939). Perhaps it is not surprising, therefore, that rates for severe problems such as schizophrenia based on admissions to the state hospitals tended to cluster about the center of the city.

It is quite likely that patients admitted to state hospitals would be from lower socioeconomic status groups living near the center of the city. This would be especially true, for example, when 7,000 admissions to the state psychiatric hospital were used as the basis for a map reflecting a very "definite pattern" of high insanity rates clustered about the center of the city and becoming progressively lower at greater distance from the center (Faris and Dunham 1939, map 2). While data from selected private hospitals were used in determining geographical patterns of other types of mental illnesses, lack of specification prevents assessing possible implications for determining other geographically variable rates.

A somewhat later study of the prevalence of mental illness (Goldhamer and Marshall 1953) does mention Jarvis and his "law of distance" specifically, apparently among the first to do so in the twentieth century. This specific mention was made in the study undertaken to provide a case against the continuing conviction that "civilization," with its high degree of "individuation, personal insecurity and competitiveness," and its "killing pace," was responsible for a large proportion of psychoses. Data were selected from state mental hospitals and almshouses, county "receptacles" for the insane, town almshouses, and private hospitals. Massachusetts was selected as the study site because "since 1840, its facilities for the care of the mentally ill during the last half of the 19th century were . . . more advanced than those of most other states" and, most important to the topic of this article, the relatively small size of Massachusetts "diminishes the mean distance of the population from a mental hospital." The authors further acknowledge "it has been well known *for some time now* [emphasis added] that the tendency, especially in the past, to hospitalize the

mentally ill is inverse to their distance from a mental hospital" (Goldhamer and Marshall 1953). It was suggested that while the law of distance "still operated today" it did so with much "diminished force" and was, therefore, not included in the computations of this study.

Finally, the "law of distance" is again mentioned, but confined principally to a footnote referring to the study above (Goldhamer and Marshall 1953), in the *Midtown Manhattan Study* of mental illness in New York City (Srole et al. 1962). Despite being relegated to a footnote, observed intergroup differences in hospital rates were thought to be dependent in part upon variations in mental hospitals' bed capacities and the locations of the hospitals relative to the "spatial distance from large population centers."

Thus, most major studies from the beginning to the middle of the twentieth century dealing with the distribution and etiology of mental illness ignored or, at best, gave limited and indirect attention to the association between distance and hospitalization in asylums. By the mid-twentieth century, however, several studies formed the basis for a renewed and increasingly widespread interest in this relationship.

Jarvis's Law and Mental Hospital Admissions

In Denmark, there were several more studies of spatial variation in admission rates to the state hospital at Risskov, the same hospital that Selmer (1879) used for his study. Some 75 years after Selmer's investigation, decreased admission rates with increasing residential distance were again reported (Svendsen 1954). A Danish commission on mental health subsequently examined patterns of admission rates to the same hospital for selected years between 1921 and 1950, again finding higher admission rates from areas nearby as compared to more distant ones (Bille 1963). This commission also reported that proximity was significantly related to increased admission rates to a newly built mental hospital in the district where previously there was none. Finally, another study of first admissions to the state mental hospital at Risskov between 1949 and 1951 found consistently higher first-admission rates from Aarhus, the principal town near Risskov, compared with admission rates from Allborg, some 110 km. (70 miles) away (Bille 1963). In this latter study, though differences in percentages varied, especially higher rates were found among men than women from nearby areas. Contrary to the assumption of decreased importance of distance by

Goldhamer and Marshall (1953), it was suggested that while transportation obviously had improved since the mid- and late nineteenth century, it remained an important factor causing people to hesitate in admitting their chronic sick relatives to a "distant" institution (Bille 1963).

In Norway first-admission rates to mental hospitals were grouped according to whether the patient came from an inner zone (15-20 km. from the hospital) or an outer zone (80-100 km.) measured "as the crow flies" (Astrup and Odegard 1960). The observed inverse relation between distance and admission was significant until after World War II when it "disappeared altogether." This "disappearance" was believed to be due to "advances in communication and travel mindedness" during the period. Admissions for only one post–World War II year, however, were included in the study and "disappearance" of the distance effect is based on rates for the single year. There are some other probable mediating factors that influenced admissions. Certainly, there is a possibility this postwar year may have been very atypical in terms of manifestation of a large residual or latent demand for mental health care denied during the war years, in addition to an increase in mental problems caused by the war. This notion gains support from studies relating to closure of facilities in Holland during the war (Lekkerkerker 1946), increased admissions to Danish mental hospitals associated with the surrender of German occupying forces (Ravn 1946), and psychiatric morbidity among civilians during wartime (Svendsen 1952).

Returning to North America, more than 100 years after publication of Jarvis's observations, the "distance factor" reemerged in mental health services research. Specifically, an analysis was conducted to discern possible factors underlying observed regional differences in the prevalence of mental illness in western Ontario (Buck, Wanklin, and Hobbs 1955). Distance was not initially included among the factors assumed to be significantly related to admissions to mental hospitals (upon which prevalence rates were based). Regional variations in urban-rural residence, marital status, nativity, economic status, and education were initially included. Regional variations, however, could not be adequately explained as simple functions of these population variables. It was determined that urban-regional variations in admission rates and hence prevalence of mental illness among older people were a function of the availability of hospital facilities since two of the five

counties with highest admission "levels" were those in which the mental hospitals were located. Distance measures were not included in the published results.

Interest in the distributional patterns of patients with schizophrenic reactions prompted examination of first-admission rates at the Ohio State Mental Hospital (Locke et al. 1958). First admissions during a 4½ year period (1948 to 1952) were examined with particular emphasis on the approximately 6,000 patients admitted and diagnosed as having schizophrenia. Each patient was classified by age, sex, marital status, color, county of residence, urban-rural residence, education, employment, occupation, and diagnosis. Considerable discussion centered on "aberrations" in the observed versus the expected results. As in the Canadian study above (Buck, Wanklin, and Hobbs 1955) it was especially disturbing that socioeconomic factors did not provide the expected explanations for differences in admission rates, especially in metropolitan areas. It was concluded that these aberrations might be due to the availability of mental facilities. Further, it was suggested that patient registers be established to provide a more comprehensive data base upon which to determine geographical patterns of mental illness.

A study of first admissions to state hospitals in Minnesota found 52 percent came from the hospitals' "host" counties, although they contained only 13 percent of the population (Aanes 1972). And, in a study of variation in first admissions to Warren State Hospital in Pennsylvania, residences of patients prior to first admission to the hospital between 1948 and 1952 were allocated to four distance zones (Person 1962). Again, first admissions generally declined with increasing distance from the hospital. It was suspected, however, that distance alone might not entirely account for the observed pattern and the presence of other "nosocomial influences" (Svendsen 1952; Norris 1959), including other mental health care services, and the distribution and referral practices of physicians were suggested as possible factors related to the observed patterns.

Two studies of first admissions to state mental hospitals in Connecticut are particularly important here since they addressed some of these specific issues and examined the possibility that Jarvis's law might be an artifact resulting from "nosocomial influences," such as the distribution of high-risk groups, the urban-rural discontinuity, or possibly the distribution of alternative psychiatric services (Sohler

1970; Sohler and Thompson 1970). First admissions to Connecticut state mental hospitals from each town in the state were averaged over a four-year period (1959 to 1963). Jarvis's law was found to operate among all age groups for both whites and nonwhites, among those with functional psychoses as well as those with less-severe disorders, and it applied in both large and small towns. In a companion paper, the influence of the availability of psychiatric resources was examined specifically, including the number of psychiatrists per capita, number of clinic hours per week per capita, and number of psychiatric beds in each town. With very minor exceptions, the negative correlation between admission rates and distance was maintained with availability factors controlled (Sohler 1970).

The potential effect of the organizational structure of medical and mental health services on the relation between distance and use of mental health services was recently investigated in a Canadian study (Joseph 1979). Mean distances traveled by patients to hospitals in southern Ontario varied significantly according to the referral category. Shortest travel distances were associated with referrals by nonprofessional health personnel and, not surprisingly, longest distances were associated with those patients seeking treatment as a result of referral by medical personnel. Here, the evidence suggests the variable effect of distance depending, to a certain extent, upon the referral agent (Joseph 1979).

In a subsequent study in the Peterborough, Ontario, mental health catchment area, the distance-utilization relationship was studied for different levels of illness and found to be less important and more irregular for patients more seriously ill. Utilization patterns for the less seriously ill and outpatients were strongly influenced by residential proximity to the clinic (Joseph and Boeckh 1981).

In Wisconsin the changing role of state mental hospitals from custodial care to treatment centers accompanying the community health movement spurred concern about the association between distance and utilization (Weiss, Macaulay, and Pincus 1967). First admissions to two state hospitals for a one-year period were examined and patients' residences were grouped into counties allocated to one of four 50-mile concentric zones about the hospitals. The negative relation between use and distance was again observed, but beyond a distance of 100 miles there was little change in use rates. The authors suggested that beyond about 100 miles the hospital is regarded as *distant* regardless of the actual mileage. From this as well as other studies, it is apparent

that beyond some critical and somewhat variable distance threshold there appears to be a "zone of indifference" in which the impact of relative distance is minimal (Norris 1959).

Distance emerged as a factor of major importance in a study of admission rates to state psychiatric hospitals in California (Blumberg 1965). Apparently influenced by Scandinavian research (Svendsen 1954) and the *Midtown Manhattan Study* (Srole et al. 1962), the effect of distance on admission rates was systematically investigated. Experiments were first conducted with several distance measures prior to selecting "constructive mileage" to approximate travel time on the roads between county population centers and state psychiatric hospitals. This measure of distance, together with county characteristics—presence or absence of a state mental hospital, percentages of Spanish and black populations, total population, size, proportion of population separated/divorced and married, and percentage of labor force unemployed—were subsequently used in a multiple correlation analysis of county admissions to state psychiatric hospitals. Of these variables, distance to the nearest state hospital was most highly correlated with admissions ($R = 0.68$).

In this same study, to examine the distance variable more closely a second list of variables was developed, adding the age structure of the population, the proportion married, and the percentage of the counties' populations that was urban. The addition of these variables did not offset the importance of distance as the best "predictor" of hospital admissions. The continued, strongly negative correlation was considered "highly significant" to understanding demand and planning for mental health services throughout California. It was further suggested that the provision of more accessible psychiatric services could result in a doubling of demand in certain locations.

The importance of distance as a factor in use of long-term mental care facilities continues to derive from diverse geographic settings. In sparsely settled Western Australia, statistical divisions were rank-ordered by distance from Perth, site of the only specialized psychiatric facility in the state (Stampfer et al. 1984). For all diagnoses, total hospitalization rates declined with increasing distance, the greatest impact being on patients with the least severe illness. And again, a "threshold distance" is posited, beyond which travel distance per se was not an important factor in admission rates. In the vast spaces of Western Australia, this zone of indifference was very extensive.

In Zambia, the pattern of psychiatric admissions reflected in product

moment correlation coefficients measuring the relationship of distance from psychiatric facilities against the admissions rate was consistently substantial and negative, supporting the contention that "as service is brought close to the people, the more it will be used" (Haworth 1980-1981).

First-admission rates to a mental hospital in Tasmania also reflected a significant decline with increasing residential distance from the facility when controlled by various patient characteristics such as age, marital status, occupation, religion, and area of residence (rural or urban) (Davey and Giles 1979). Interestingly, the authors chose an "alternative explanation" to Jarvis's law, namely, that people residing in areas nearest to the hospital were "overusing" the facility. It should be mentioned here that Jarvis suggested this possibility as well, referring in a later work to "this law of nearness, *inviting and increasing patients* [emphasis added], and of distance" (Jarvis 1866, 404).

A statistically significant decrease in the frequency of admissions occurred at a distance of approximately 70 to 80 km. (44 to 50 miles) from hospitals in Poland regardless of the degree of urbanization within a region (Slupczynska 1975). Beyond this distance band, the "zone of indifference" was documented.

Finally, several studies in Germany demonstrated the effect of distance on obtaining psychiatric treatment. In the distribution of first-admission patients' residences as well as those repeatedly admitted to a mental hospital, admissions were allocated to one of three distance zones centered on a hospital, and it was found that admission rates decreased significantly with increasing distance from the hospital for both patient categories (Weyerer and Dilling 1978; Dilling and Weyerer 1980).

Long-term Care and Distance

Level of impairment, socioeconomic status, family status, and organizational structure of the medical care sector are among the variables tempering the negative relation between residential distance from mental health care facilities and utilization. Nevertheless, the evidence is considerable in support of the operation of the distance factor regardless of other factors. It would seem prudent to suggest, therefore, that in current considerations pertaining to the delivery of mental health services in the United States with regard to building long-

term psychiatric care facilities, the refurbishing of existing mental hospitals, or the accommodation of the chronically mentally ill within the general hospital setting, the distance factor should be included. Though much diminished in the past two decades, long-term care facilities remain important and in the near future may emerge again as an important resource in the continuing evolution of mental health care. Today, as a result of "deinstitutionalization" the majority of the mentally ill receive treatment in other settings, most notably in outpatient and community mental health care clinics. This movement developed, in part, to provide more proximal treatment opportunities (Rabiner and Hankoff 1967). Indeed, in many instances travel distances have been drastically reduced. Does distance remain a factor in the use of these "community" facilities? There is ample and increasing evidence that it does.

Distance and Clinic Utilization

The association between residential distance from and use of long-term psychiatric service facilities has a long and well-documented history; its presence in relation to the use of community mental health clinics and outpatient clinics within given small catchment areas is suggested as being relatively unimportant by some (Joseph and Phillips 1984) and has come as a surprise to others (Weinstein et al. 1976).

The association between location of outpatient care and its use was the subject of an early investigation in Minnesota. This was among the first distance research dealing with the use of outpatient rather than inpatient mental health care (Hodges and Dorken 1961). The spatial perspective here did not derive from the work of Jarvis or any other work mentioned thus far but appears to have been based on work in the general medical care field confirming the negative effect of distance on the use of general practitioners and medical specialists in western Pennsylvania (Altman 1954). Nevertheless, patients using three mental health centers were categorized by residence-facility distance using 20 mile increments and increased travel distance was significantly related to decreased use of outpatient psychiatric care. In rural areas, 40 to 60 miles (approximately 1 hour's drive) appeared to be the critical distance range. Beyond this distance, "proper" utilization was

impeded and there was an increasing tendency to forgo or postpone treatment.

In Germany the effect of distance on the use of outpatient psychiatric facilities has also been considered in relation to mental health care planning (Weyerer and Dilling 1978; Dilling and Weyerer 1980). Outpatients receiving treatment in three counties of upper Bavaria were grouped according to the distance of their residences from clinics (Dilling and Weyerer 1980). The rate of first consultations was found to be about 1½ times greater for patients from nearby places than for those from more distant zones. The effect was even greater when repeat consultations were considered, as two to three times more patients from closer areas received repeat consultations compared with patients living farther away. This relationship was especially pronounced among older patients, with 10 times as many of them coming from closer than more distant areas (Dilling and Weyerer 1980).

In association with the community mental health movement in the United States, approximately 1500 catchment areas were delineated. It might be expected that distance would be negatively related to use, especially for those rural community mental health centers serving large catchment areas, and this was the case. For instance, a Kansas catchment area covered 20 counties and about 20,000 square miles with the most distant point being about 185 miles from the community health center. Some clients were forced to travel as much as 7 hours, round trip, for an hour or less of outpatient service (Cohen 1972). Outpatient interview rates were calculated for each county and they were subsequently placed in one of six 30-mile zones beyond the home county. Reduction in use in successive zones was 50 percent, 66 percent, 61 percent, 70 percent, and, finally, in counties at least 180 miles away, there was a 78 percent reduction in use of services compared to the home county rate. Though relatively lower use rates were observed, there was little difference between counties 120 and 180 miles away, reflecting a zone of indifference beginning approximately 100 miles away from the health center. Furthermore, counties located on major highways connecting them with the community mental health center had considerably higher use rates than counties with more limited access. Concluding that distance was an important impediment to proper use, a district outpatient clinic was established in one of the more remote sections of the catchment area. Within a short period of time, an average increase of 19 percent in outpatient

mental health service use was observed among the eight communities served by the new and "nearer" clinic.

At the other end of the catchment-area size continuum, a study was conducted for a community mental health center in New York City (Weinstein et al. 1976). The catchment area covered only about 2 square miles, but it contained a population of approximately 200,000 people. Even within this small catchment area, which was well served by public transportation, the proximity of the treatment facility to the various neighborhoods had a substantial and, at least to the researchers, surprisingly strong bearing upon the use of its services. The highest per capita use rates were observed in the areas most proximate to the facility, and areas nearest the center generated higher utilization rates than "would be expected based on characteristics of the general population in those areas" (Weinstein et al. 1976). Reflecting on the fact that it is almost a "truism" within mental health care that if more facilities are available more people will use them, the authors report that the strength of the association within these relatively small areas "was not expected."

Additional documentation of the distance effect on use of community mental health centers in small urban catchment areas comes from a Baltimore study explicitly focusing on Jarvis's law (Breakey and Kaminsky 1982). Utilization of an outpatient mental health clinic located in a poor inner-city area was analyzed. Distances from the geographic centers of census tracts in the catchment area were measured and ranged from about 0.27 km. (0.16 miles) to 2.24 km. (1.34 miles). Controlling for race, social "disadvantage," and income, results of the analysis indicated a significant negative relation between enrollment rates and distance from the clinic. Again, even within this very small area the zone of indifference to travel was observed as use rates declined significantly in census tracts up to a distance of about 1.2 km. (0.75 miles) from the clinic. Beyond this distance there was no further consistent decline. And, the association between distance and use was attenuated in directions that were better served by buses (Breakey and Kaminsky 1982).

As in the extensive catchment area in Kansas, in both New York City and Baltimore additional "satellite" clinics were suggested, to be located at the "extremities" of the catchment areas or in "strategic locations" in order to make the services more available and more acceptable to the populations residing there. It further was suggested

there might be "natural" catchment areas more appropriate for locations of community mental health centers than the "official" areas assigned to them (Weinstein et al. 1976), and that present boundaries should be "reconsidered" with regard to travel to mental health clinics within the city since some patients are "reluctant" to travel through "hostile" or "strange territory" (Schwartz 1974). The expressed concern with "strategic locations" in order to make the services more available and acceptable may transcend, to a certain extent, the simple notion of physical distance and reflect the importance of neighborhood as an important social and psychological "territory" or "turf" especially within large cities.

Occasionally, studies report that distance is not associated with use of outpatient mental health facilities. For instance, in a study of first-appointment compliance at an outpatient mental health facility in Rochester, New York (though no figures are given), no significant differences in use were found on the basis of distance between patients' residence and the clinic (Carpenter et al. 1981). This was partially accounted for "by the [alleged] fact that our setting has a well-organized transportation system that adequately serves the facility studied." Unfortunately, measures used for distance, use patterns, and statistical analysis were not included in the published report, obviating an evaluation of this suggestion.

Especially important evidence supporting the negative association between distance and clinic use can be found in studies conducted in the Veterans Administration medical system. Within this system, not only is there no out-of-pocket cost for treatment but the cost of travel to care is reimbursable. This situation provides what might be considered a natural experimental setting, where the direct monetary costs of travel and the price of care are removed from consideration and the effect of distance can be ascertained more precisely.

A study conducted among a sample of 161 veterans eligible for treatment at the Denver Mental Hygiene Clinic (DMHC), 80 of whom applied for treatment and 81 did not (Diener and Young 1961), was aimed at determining which variables, if any, differentiated the two groups. These independent variables were tested: (1) whether, on the basis of marital status and living arrangement, the veteran was categorized as an "adult" or "child"; (2) degree of disability; (3) residential status in terms of urbanization; (4) distance of patient's residence from the DMHC; and (5) decreases in veteran's compensation. Two were found

to be significant: disability and distance. The greater the degree of disability and the closer the veteran lived to the DMHC, the more likely he was to apply for outpatient treatment (Diener and Young 1961).

A follow-up study further assessed the relative effects of distance and degree of disability on requests for psychiatric treatment (Dworin, Green, and Young 1964). All Colorado veterans with a primary psychiatric diagnosis for whom a current address was available were included in the analysis, and cases were classified according to residential location and distance from the DMHC. Controlling for the original independent variables and for use of alternate psychiatric services, distance was found to be the most strongly correlated variable with DMHC use. This necessitated revision of conclusions reached in the earlier study, since distance was found to be even more important than originally observed.

Within the Veterans Administration medical system, the association between distance and use of "after-care" services has also been assessed. In one instance, for the area around Jackson, Mississippi, variables related to veterans' return for after-care subsequent to hospitalization for alcoholism were analyzed (Prue et al. 1979). Here again, special attention was placed on distance, since many of the other variables included in previous V.A. studies such as socioeconomic status, marital status, and the like were considered not readily "manipulable" or amenable to policy intervention.

Medical record data were obtained for subjects randomly selected from a group of patients admitted to the Alcohol Treatment Unit of the Jackson V.A. hospital. The dependent variable consisted of the proportion of the first five scheduled follow-up visits that were actually attended. The independent variables in this multivariate analysis included the number of miles from the patient's home to the nearest major highway, miles traveled on major highway, total number of miles traveled to reach treatment facility, possession of valid driver's license, and automobile ownership, as well as the other usual sociodemographic variables.

Of these variables, the distance measures of "miles to" and "miles on" the highway made the largest contribution to the explained variance in after-care attendance, while total miles from the service facility were also found to be significant (Prue et al. 1979). Of additional interest is the observation that "miles to a highway" was relatively more

important than "miles on" a highway, the former perhaps providing a more sensitive measure of "remoteness" or isolation from the facility. Unfortunately, patients residing within the city of Jackson were excluded from consideration in the study in the belief that the "critical distance variables, which were of primary concern, would not be likely to play a role in Jackson residents' attendance at after-care services" (Prue et al. 1979).

A similar line of reasoning was applied in examining factors related to alcoholics' attendance at after-care clinic sessions in a V.A. facility in Miami, Florida (Pratt et al. 1977). To "control" for the possible effects of distance, a criterion for inclusion in the study was patient residence within a 40 mile radius of the treatment facility. It was assumed that distance would have no impact within a 40 mile radius of the clinic, and all patients within the area described by the radius were considered homogeneous with respect to geographic accessibility. As we have seen, other research does not support this assumption, and, in fact, the reverse may be true: the impact of distance may have been greatest within the 40 mile range. Both of the studies in Mississippi and in Florida failed to consider the effects of travel distance within a possible critical distance range.

The Concept of Distance

While there is a long tradition of concern with distance in the mental health care literature, there has been little variation or progress in its conceptualization or measurement. To date, and almost without exception, residence and facility separation has been measured by linear distance in miles and/or kilometers. These measures are, however, typically aggregate estimates that may contain gross errors of measurement. In no instance have the actual distances from individuals' homes to a facility been measured in utilization studies. (A study of the "effectiveness" of care in satellite mental health facilities reportedly did incorporate specific distances [Smith 1976]. Residence to facility distance was not significantly related to readmissions to a mental hospital.) Rather, distances from population centers such as county seats or other area units, such as geographic "centers" of census tracts or postal zones, are used. Furthermore, distances are frequently arbitrarily aggregated into geographic zones, reducing the amount of individual variation. In most instances, the zone size is determined without

regard to any meaningful link with actual behavior or geographic setting. That is to say, the distance ranges that might reflect the actual behavior of individuals can only be ascertained if the distributions of general travel distances are first examined and empirical criteria are established for their grouping. It may well be that smaller groupings or zones will be appropriate within short-distance ranges from the homeplace, and that larger groupings are appropriate for long-range distances. In this case, the use of equivalent distance groupings may not be appropriate.

Moreover, the geographic scale of the study area will determine the suitability of the aggregate distance measures. In large study areas, such as the 20,000 square mile catchment area in Kansas, the use of straight line distances from county seats to a community mental health clinic might not affect the results substantially. On the other hand, such estimates of distances between census tracts and postal zones in metropolitan areas would be imprecise.

In these latter instances, the appropriateness of "straight-line" or "as the crow flies" distances should also be reconsidered. Within the urban environment, we are usually prevented from taking a straight line path from origin to destination by the rectangular grid network of blocks and streets characteristic of urban morphology (Haggett and Chorley 1969). Therefore, it may be appropriate to use an alternative physical distance measure which attempts to take the urban pattern into account. Such a measure has been used in urban geographic research—the "Manhattan" or a "taxicab" metric which more closely approximates "route distance" (Gatrell 1983). Rather than the straight line distance between points of origin and destination, distance is viewed as the sum of the intervals of the "legs" of the triangle connecting the two points. Of course, another distance measure possible is the calculation of the shortest direct path between two points. This latter distance is based on the assumption of behavior according to the "principle of least effort" in which the individual selects the shortest route between two points. Computation usually necessitates "tracing" a presumed path and recording the aggregate distance between points. This latter procedure is effective only with small samples unless a geocoding system is available.

Refinement of present measures of distance seem essential to gaining a better understanding of its relationship to use. In lieu of more sophisticated refinement, relatively simple adjustments or classifications

of distance such as "miles to" and "miles on" a highway lead to more sensitive and meaningful assessment.

Distance in Two Dimensions

Thus far, each of the suggested possible revisions in the measure of physical distance is based on a single origin and destination. By considering multiple destinations and associated distances and directions from an origin, such as the homeplace, an additional spatial property related to human behavior, the activity space, may be incorporated into mental health care research and planning.

Briefly, the activity space is comprised of those locations which an individual or family unit uses in the course of everyday life. Locations such as school, work, shopping, recreation, voluntary associations, as well as friends' and relatives' homes may be considered in a general activity space analysis (Dacey 1971; Chapin and Brail 1969). For each individual or household unit, a specific activity space may be computed and summarized through appropriate bivariate statistical procedures providing summary areal measures of the space (Neft 1966; Yuill 1971).

Important here are attempts to delineate aggregate activity spaces in metropolitan areas (Shannon and Spurlock 1976). It is suggested that these activity spaces may be more appropriate than residential patterns in determining the location of certain types of health care facilities. Given the types of problems in delineating urban mental health service catchment areas, the use of aggregate activity spaces may contribute to a more rational and effective means of locating mental health centers and satellite clinics (Marcos and Gil 1984). This may resolve some of the problems described earlier regarding the identification of "natural" rather than arbitrary catchment areas (Weinstein et al. 1976) as well as travel and accessibility problems related to "hostile" areas of cities as perceived by patients and potential patients alike.

Travel Time

With the exception of one attempt to approximate highway travel time (Blumberg 1965), none of the mental health research reviewed

has used travel time as a measure of distance. This probably reflects reliance on patient records rather than patient interviews from which personal estimates of travel time might be obtained. Since its introduction into medical care research generally (Marrinson 1954), travel time has been recommended by the American Hospital Association and the U.S. Public Health Service for use in analysis of patient travel (U.S. Public Health Service 1961). Again, the relative value of the physical versus the temporal measures of distance may vary according to the setting. In rural areas, travel time and physical distance may be positively correlated. Even here, there is evidence that physical distance of different types may have differing effects on use of service; recall, for example, differences obtained by "miles to" and "miles on" major highways in the V.A. study in Mississippi (Prue et al. 1979).

It is generally acknowledged that, within urban areas, travel time is a more realistic and more accurate measure of distance than simple physical measures. Moreover, it has been demonstrated that different conclusions regarding accessibility may be reached when using physical or temporal measures of travel to medical care facilities (Shannon and Bashshur 1973). The cost of obtaining temporal information (via patient interview) may be alleviated by transforming traditional geographic street maps to "isochronal" maps which indicate from a given point the travel time to all destinations (Blome 1963). Thus, by plotting a residential address on one of these maps, the travel time to a facility may be estimated directly. This measure can be adjusted to take into account road patterns, speed of travel, and availability of transportation facilities.

Extending the Concept of Distance

However measured, the notion that the distance or separation between the client's homeplace and the location of a mental health facility influences use of that facility is well documented and accepted. Certainly, more precise measures of physical distance and, in certain instances, use of the more sensitive measure of travel time will contribute to a better understanding of the nature and magnitude of this influence. An even more comprehensive understanding of the phenomenon might be possible if the distance concept is extended beyond the traditionally measured travel. If distance is measured by time, which more closely reflects the travel experience, then additional elements may be included,

specifically those measured by time and identified as being relevant to accessibility of care—appointment-delay time and office-waiting time. While financial barriers continue to be important in the use of health services generally, public programs such as Medicare and Medicaid and third party coverage have rendered these barriers somewhat less formidable. Thus, out-of-pocket costs, though still substantial for some, have been reduced for many people. In this situation, it is being increasingly realized that "convenience factors" such as travel time, appointment-delay time, and office-waiting time play an important role in the individual's decision to use or not use available health services, regardless of other factors (Acton 1975; Miners et al. 1975). Indeed, these are the only access measures for which quantitative national standards have been established in accordance with the goals of the National Health Services Planning and Development Act of 1974 (Public Law 93-641).

Accordingly, in other than exceptional situations, a source of primary care should be available within 30 minutes travel time, appointment-delay time should be no longer than seven days, and waiting-room time (beyond the time of appointment) should be no longer than 30 minutes. These standards were empirically derived from average times obtained in a national health survey (Chen 1978). Setting aside for the moment questions of appropriateness and general applicability of these standards, at the least, formal recognition has been given to the distance or "separation" component of medical care accessibility. These standards have been used in assessing accessibility to and use of primary medical care services (Aday 1975). Particularly germane here is that appointment-delay time has surfaced as a problem in outpatient mental health care (Korner 1964) and appointment-delay time was found to be positively associated with failure to attend scheduled outpatient psychiatric treatment sessions (Carpenter et al. 1981). To date, there has been no systematic attempt to apply these measures of distance either separately or simultaneously or to the use of mental health care facilities.

Probably the most important development in this regard is the work begun to combine these three measures into a composite index of "access" that includes travel time, appointment-delay time and waiting-room time (Chen 1978). Such a "composite" index of access could be used separately or in conjunction with other variables in attempts to explain the use or nonuse of mental health services as well as plan for their location and delivery.

It is important to reemphasize here the observed "zone of indifference," a threshold distance beyond which increased distance from a mental health facility has little effect. Across large and small catchment areas and for both inpatient and outpatient facilities there appears to be a maximum effective distance for patient travel. Identification of such boundaries among clientele could assist in determining suitable areas for the establishment of additional facilities such as proposed in several instances reviewed here.

Conclusions

Interest in distance as it relates to use of mental health services has a long history and is related to several important issues. In most instances, distance measures used in research have been aggregate and simple linear physical interpretations of separation of a client's residence from that of a service facility. In the overwhelming majority of instances, the negative relation between distance and use has been supported using these measures. Certainly, as suggested by some (Norris 1959) other nosocomial factors may modify this relationship, including characteristics of the medical care environment, socioeconomic status, referral sources, and the seriousness of the health problem. Nevertheless, distance seems to operate in most settings. Especially important is the fact that distance is one of the more pragmatic or manipulable variables. While variables such as marital and economic status, degree of disability, and the like may influence the use of mental health services, these variables are not readily mutable. On the other hand, the distance factor is a policy-mutable variable since it is subject to variation by policy through improved location of mental health services and development of transportation programs to existing facilities.

For policy and for assessing the quality of care, distance may need to be considered in evaluating outcomes as well. For instance, in one interesting study of the use of nursing homes, it was found that "distance from family and friends" had a negative effect on the adjustment that patients made to living in nursing homes (Abdo et al. 1973).

Revised measures of distance as well as extensions of the distance concept to include temporal measures of travel, appointment delay, and office-waiting time may contribute to a more comprehensive understanding of the "convenience" factor in use of mental health

services. Additionally, activity-space analysis may provide an alternative or supplemental strategy for determining "strategic" or "natural" locations for mental health facilities and the delineation of service or catchment areas within urban areas. Those responsible for planning, research, and administration related to mental health care should continue to consider seriously the distance factor and attempt to incorporate refined measures and extended concepts of distance in their future efforts.

As the human and health services delivery systems undergo transformations such as organizational consolidation of providers and increased competition, factors such as access, client demand, and delivery-system efficiency take on new policy importance. Under vertical integration of services, particularly in mental health, providers will be seeking to develop delivery settings and sets of services that make sense from an economic and marketing perspective. Concern with client acceptability and convenience, site choice, and proximity to related facilities and services will be major emphases. Moreover, determination of the geographic prevalence of mental health problems, the basis of much policy development, is intricately related to questions of geographic availability and accessibility of service.

Public policy will need to reflect, and policy makers assess, the impact of the changing delivery system upon evaluating mental health status and the mental health care needs of the population. To the extent that these are carried out through marketplace decisions rather than regulation, the monitoring and evaluation need is all the more important. What has been described here is a regularity of human behavior through time and across space which can be used for developing better regulation or marketplace decisions.

References

Aanes, D., D. Klaessy, and J. Dills. 1975. The Impact of a Community Hospital's Psychiatric Unit on a Regional State Hospital. *Hospital and Community Psychiatry* 26(9):596–98.

Abdo, E., J. Dills, H. Shectman, and M. Yanish. 1973. Elderly Women in Institutions vs. Those in Public Housing: Comparison of Personal and Social Adjustments. *Journal of the American Geriatric Society* 21:81–87.

Acton, J.P. 1975. Nonmonetary Factors in the Demand for Medical Services: Some Empirical Evidence. *Journal of Political Economy* 83(3):595–614.

Aday, L.A. 1975. Economic and Noneconomic Barriers to the Use of Needed Medical Services. *Medical Care* 13(6):447–56.

Altman, I. 1954. Distances Traveled for Physician Care in Western Pennsylvania. *Public Health Monograph* 19, part 2. Washington: U.S. Public Health Service.

Astrup, C., and O. Odegard. 1960. The Influence of Hospital Facilities and Other Local Factors upon Admissions to Psychiatric Hospitals. *Acta Psychiatrica Neurologica Scandinavia* 35:289–301.

Bille, M. 1963. The Influence of Distance on Admissions to Mental Hospitals: First Admissions. *Acta Psychiatrica Scandinavia-Supplementum* 169(39):226–33.

Blome, D.A. 1963. *A Map Transformation of Time-Distance Relationships.* East Lansing: Institute for Community Development, Michigan State University.

Blumberg, M.S. 1965. *Psychiatric Bed Needs: Factors Relating to Demand for Psychiatric Services in California.* Sacramento: Office of Planning; California Department of Mental Hygiene.

Breakey, W., and M. Kaminsky. 1982. An Assessment of Jarvis' Law in an Urban Catchment Area. *Hospital and Community Psychiatry* 33(8):661–63.

Buck, C., B. Wanklin, and G. Hobbs. 1955. An Analysis of Regional Differences in Mental Illness. *Journal of Nervous and Mental Disorders* 12(12):73–79.

Carpenter, P., G. Morrow, C. Del Gaudio, and B. Ritzler. 1981. Who Keeps the First Outpatient Appointment? *American Journal of Psychiatry* 138(11):102–5.

Chapin, F.S., Jr., and R.K. Brail. 1969. Human Activity Systems in the Metropolitan United States. *Environment and Behavior* 107–30.

Chen, M. 1978. A Quantitative Index of Access to Primary Medical Care for Health Planning. *Socio-Economic Planning Sciences* 12:295–301.

Cohen, J. 1972. The Effect of Distance on Use of Outpatient Services in a Rural Mental Health Center. *Hospital and Community Psychiatry* 23(3):79–80.

Cross, K., and R. Turner. 1974a. Factors Affecting the Visiting Pattern of Geriatric Patients in a Rural Area. *British Journal of Preventive and Social Medicine* 28:133–39.

———. 1974b. Patient Visiting and the Siting of Hospitals in Rural Areas. *British Journal of Preventive and Social Medicine* 28:276–80.

Dacey, M.F. 1971. Two Dimensional Urban Contact Fields. *Geographical Analysis* 3(2):109–20.

Davey, S., and G. Giles. 1979. Spatial Factors in Mental Health Care in Tasmania. *Social Science and Medicine* 13(2):87–94.

Dawson, W.R. 1911. The Presidential Address on the Relation between the Geographical Distribution of Insanity and that of Certain Social and Other Conditions in Ireland. *Journal of Mental Science* 57(239):591–97.

Diener, R.G., and H.H. Young. 1961. Factors Contributing to Requests for Mental Hygiene Clinic Treatment by Veterans with Psychiatric Disorders. *Journal of Clinical Psychology* 17(4):397–99.

Dilling, H. and S. Weyerer. 1980. Incidence and Prevalence of Treated Mental Disorders: Health Care Planning in a Small-town Rural Region of Upper Bavaria. *Acta Psychiatrica Scandinavia* 61:209–22.

Dworin, J., J.A. Green, and H.H. Young. 1964. A Follow-up Study of Relationships Between Distance from the Clinic, Degree of Disability, and Requests for Psychiatric Treatment. *Journal of Clinical Psychology* 20(4):393–95.

Elkind, H.B. 1927. Epidemiology of Mental Disease: A Preliminary Discussion. *American Journal of Psychiatry* 6:623–40.

Elkind, H.B., and M. Taylor. 1936. The Alleged Increase in the Incidence of the Major Psychoses. *American Journal of Psychiatry* 92:817–25.

Faris, R.E.L., and H.W. Dunham. 1939. *Mental Disorders in Urban Areas: An Ecological Study of Schizophrenia and Other Psychoses*. Chicago: University of Chicago Press.

Galt, J.M. 1855. The Farm of St. Anne. *American Journal of Insanity* 11:352–57.

Gatrell, A.C. 1983. *Distance and Space: A Geographical Perspective*. Oxford: Oxford University Press.

Goldhamer, H., and A.W. Marshall. 1953. *Psychosis and Civilization: Two Studies in the Frequency of Mental Disease*. Glencoe, Ill.: Free Press.

Haggett, P.L., and R.J. Chorley. 1969. *Network Analysis in Geography*. New York: St. Martin's Press.

Hankoff, L., C. Rabiner, and C. St. George Henry. 1971. Comparison of the Satellite Clinic and the Hospital-based Clinic. *Archives of General Psychiatry* 24:474–78.

Haworth, A. 1980–1981. The Distance Factor in the Use of Psychiatric Facilities. *Medical Journal of Zambia* 15:6–9.

Hodges, A., and H. Dorken. 1961. Location and Outpatient Psychiatric Care. *Public Health Reports* 76(3):239–41.

Hospital and Community Psychiatry. 1976. A Century of Debate Surrounds Community Care. 27(7):490.

Hunter, J.M., and G.W. Shannon. 1985. Jarvis Revisited: Patterns of Mental Illness in the Mid-19th Century. *Professional Geographer* 36:2.

Illinois Society for Mental Hygiene. 1939. Psychiatric Facilities in Chicago. *American Journal of Psychiatry* 95:1227–29.

Jarvis, E. 1850. The Influence of Distance from and Proximity to an Insane Hospital on its Use by Any People. *Boston Medical and Surgical Journal* 42(11):209–22.

———. 1852. On the Supposed Increase of Insanity. *American Journal of Insanity* 8:333–64.

———. 1866. Influence of Distance from and Nearness to an Insane Hospital on Its Use by the People. *American Journal of Insanity* 22:361–418.

Joseph, A.E. 1979. The Referral System as a Modifier of Distance Decay Effects in the Utilization of Mental Health Care Services. *Canadian Geographer* 23(2):159–69.

Joseph, A., and J. Boeckh. 1981. Locational Variation in Mental Health Care Utilization Departments upon Diagnosis: A Canadian Example. *Social Science and Medicine* 15:395–404.

Joseph, A., and D. Phillips. 1984. Jarvis' Law and the Utilization of Mental Health Care. In their *Accessibility and Utilization* 143–60. New York: Harper and Row.

Korner, H. 1964. Abolishing the Waiting List in a Mental Health Center. *American Journal of Psychiatry* 120:1097–1100.

Lekkerkerker, E.C. 1946. Mental Health in Occupied Holland. *Mental Hygiene* 30:355.

Locke, B.Z., M. Kramer, C.E. Timberlake, B. Pasamanick, and D. Smeltzer. 1958. Problems in Interpretation of Patterns of First Admissions to Ohio State Public Mental Hospitals for Patients with Schizophrenic Reactions. *Psychiatric Research Reports* 10: 172–96.

MacDonald, M. 1981. *Mystical Bedlam*. Cambridge University Press: Cambridge, England.

Malzberg, B. 1937. The Expectation of Mental Disease in New York City in 1930. *Mental Hygiene* 21:280–90.

Marcos, L., and R. Gil. 1984. Psychiatric Catchment Areas in an Urban Center: A Policy in Disarray. *American Journal of Psychiatry* 141(7):875–78.

Marrinson, R. 1954. Hospital Service: Time Replaces Space. *Hospitals* 38:53–54.

Miners, L., S. Greeve, E. Salber, and R. Scheffler. 1975. Demand

for Medical Care in a Rural Setting: Racial Comparisons. *Health Services Research* 13(3):595–614.

Neft, D.S. 1966. *Statistical Analysis for Areal Distributations*, Monograph series no. 2. Philadelphia: Regional Science Research Institute.

Norris, V. 1959. *Mental Illness in London*. London: Chapman and Hall.

Person, P.H. 1962. Geographic Variation in First Admission Rates to a State Mental Hospital. *Public Health Reports* 77(8):719–31.

Pratt, T., M. Linn, J. Carmichael, and N. Webbe. 1977. The Alcoholic's Perception of the Ward as a Predictor of Aftercare Attendance. *Journal of Clinical Psychology* 33(3):915–18.

Prue, D., T. Keane, J. Cornell, and D. Foy. 1979. An Analysis of Distance Variables That Affect Aftercare Attendance. *Community Mental Health Journal* 15(2):149–54.

Rabiner, C., and L. Hankoff. 1967. Satellite Neighborhood Clinics. *Hospital and Community Psychiatry* 18(8):282–84.

Ravn, J. 1946. Admission to Mental Hospitals of Nykobling Sjalland Caused by Events in Denmark in Connection with Surrender of German Occupation Forces. *Acta Psychiatrica et Neurologia* 21:671–85.

Rothman, D. 1971. *The Discovery of the Asylum, Social Order and Disorder in the New Republic*. Boston: Little, Brown.

Schwartz, S. 1974. Decentralizing a Community Mental Health Center's Service Delivery System. *Hospital and Community Psychiatry* 25(11): 740–42.

Selmer, H. 1879. *Statistiske Meddelelsee og Undersogelser fra Sindssygeanstalten ved Aarhus i denst forste 25 Aar (1852–77)*. Kjobenhavn: Hos C.A. Reitzel.

Shannon, G.W., and R.L. Bashshur. 1973. Time and Distance: The Journey for Medical Care. *International Journal of Health Services* 3(2):237–44.

Shannon, G.W., R.L. Bashshur, and C. Metzner. 1969. The Concept of Distance as a Factor in Accessibility and Utilization of Health Care. *Medical Care Review* 26(2):143–61.

Shannon, G.W., and C. Spurlock. 1976. Urban Ecological Containers, Environmental Risk Cells and the Use of Medical Services. *Economic Geography* 52:136–46.

Sibbald, J. 1861. The Cottage System and Gheel. *Journal of Mental Science* 7:32–61.

Slupczynska, E. 1975. Wplyw Odleglosci Miejsca Zamieszkania Od Szpitali Na Czestosc Przyjec Chorych Do Szpitali Psychiatryeznych. *Psychiatric Polska* 9(3):253–62.

Smith, C. 1976. Distance and the Location of Community Mental

Health Facilities: A Divergent Viewpoint. *Economic Geography* 52:181–91.

Sohler, K.B. 1970. Role of Alternative Psychiatric Service in Connecticut. *Public Health Reports* 85(6):510–15.

Sohler, K., and J. Thompson. 1970. Jarvis' Law and the Planning of Mental Health Services. *Public Health Reports* 85(6):503–9.

Srole, L., T.S. Langner, S.T. Michael, M.K. Opler, and T.A.C. Rennie. 1962. Mental Health in the Metropolis. *The Midtown Manhattan Study*, vols. I and II. New York: McGraw-Hill.

Stampfer, H., J. Reymond, P.W. Burvill, and J. Carlson. 1984. The Relationship between Distance, Inpatient Facilities and the Ratio of Psychiatric Admission in Western Australia. *Social Science of Medicine* 19(8):879–84.

Svendsen, B. 1952. Psychiatric Morbidity among Civilians in Wartime. *Acta Jutlandica* 24 (Suppl. A).

———. 1954. Patientskifted pa sindssygehospitalet ved Aarhus 1952. *Ugeskrift For Laeger* 116:1050–53.

Tietze, C. 1943. A Note on the Incidence of Mental Disease in the State of New York. *American Journal of Psychiatry* 100:402–5.

Tuke, S. 1814. *Description of the Retreat: an Institution for Insane Persons of the Society of Friends*. Philadelphia: Pierce.

U.S. Public Health Service. 1961. *Areawide Planning for Hospitals and Related Health Facilities*. USPHS pub. no. 855. Washington.

Weinstein, A., A. Hanley, L. Scott, and R. Stronde. 1976. Services to the Mentally Disabled of Metropolitan Community Mental Health Center Catchment Area. NIMH pub. no. B10-ADM-76-373. Washington: U.S. Department of Health, Education, and Welfare.

Weiss, P., J. Macaulay, and A. Pincus. 1967. Geographic Location and State Hospital Utilization. *American Journal of Psychiatry* 124(5): 91–95.

Weyerer, S., and H. Dilling. 1978. Zur bedeutung der Geographischen Lage Psychiatrischer Krankenhauser fur Aufnahmeraten und Aufenhaltsdauer. *Psychiatrische Praxis* 5(1):58–64.

White, W.A. 1903. The Geographical Distribution of Insanity in the United States. *Journal of Nervous and Mental Disease* 30(5): 257–79.

Yuill, R. 1971. The Standard Deviational Ellipse: An Updated Tool for Spatial Analysis. *Geografiska Annaler* 53:28–39.

Address correspondence to: Gary W. Shannon, Ph.D., Department of Geography, College of Arts and Sciences, 1457 Patterson Office Tower, University of Kentucky, Lexington, KY 40506-0027.