

# ASSESSING RESIDENTIAL SEGREGATION AMONG MEDICAID RECIPIENTS WITH PSYCHIATRIC DISABILITY IN PHILADELPHIA

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*This study assesses the extent of residential segregation among 15,246 people diagnosed with psychiatric disabilities and receiving Medicaid (MA) in Philadelphia, and an identically sized group of MA recipients serving as matched controls. Results indicate that overall levels of residential segregation among this group were modest at their most extreme, were not markedly different from a control group of Medicaid recipients without any record of treatment for severe mental illness, and were substantially reduced after taking poverty into account. There were, however, localized areas in Philadelphia that showed distinct concentrations of persons with psychiatric disability, suggesting there may be a subgroup that is more at-risk for living in areas with elevated concentrations of persons with serious psychiatric disability. © 2007 Wiley Periodicals, Inc.*

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## INTRODUCTION

In the wake of the well-chronicled deinstitutionalization of persons with psychiatric disabilities (e.g., Grob, 1995; Lamb & Bachrach, 2001; Mechanic & Rochefort, 1990), a growing body of research now focuses on assessing the extent to which persons with psychiatric disabilities have become integrated into the community. The population in question is sizeable: Jencks (1994) estimated that 800,000 persons with psychiatric disability who in 1950 would have been in long-term hospital care were living in the community in 1990, and Newman (2001) asserted that “three fourths of the 4.6 million people with severe and persistent mental illness now live most of their lives in the community” (p. 1309). Nonetheless, there is a lack of research on the geographical dimensions of this integration—where in the community this population lives.

The absence of attention to residential segregation among persons with psychiatric disability is a conspicuous gap within this growing focus on community integration, given the associations made between psychiatric disability and barriers to obtaining affordable, quality housing (Carling, 1990), as well as a “ghettoization” of persons with psychiatric disabilities in the community (Dear & Wolch, 1987). This creates a situation in community mental health similar to what Massey and Denton (1993) described in the context of racial inequality where residential segregation has been underemphasized or ignored, although its presence “systematically undermines the social and economic well-being” (p. 2) of the affected group. Given the substantial stigma associated with psychiatric disability (Link, Yang, Phelan, & Collins, 2004) and the concomitant discrimination and loss of status and power that result (Link & Phelan, 2001), residential segregation stands to be detrimental to persons with psychiatric disability in the manner described by Massey and Denton, and would inhibit the social, physical, and psychological components used to define and measure community integration on an individual level (Wong & Solomon, 2002). And although the absence of residential segregation does not ensure the presence of meaningful community integration, substantial levels of residential segregation portend poor outcomes on other community integration measures as well.

Research that has mapped addresses taken from small cohorts of psychiatric hospital admissions and discharges have found that persons with psychiatric disability, as well as community mental health services and related residential facilities, cluster in specific urban areas (Dear, 1977; Gleeson, Hay, & Law, 1998). Referred to as “psychiatric ghettos” or “services dependent ghettos,” these inner-city areas are described as physically deteriorating and socioeconomically disadvantaged (Dear, 1981; Dear & Wolch, 1987). Concentrations of persons with psychiatric disabilities in these areas occurred both because of the presence of affordable housing and the nearby location of mental health facilities and because of few residential options outside of these communities, due to neighborhood resistance, lack of suitable housing, and difficulty accessing needed services (Wolch & Philo, 2000).

In this era following deinstitutionalization, is the transition of persons with psychiatric disabilities into the community still marked by distinct patterns of residential segregation? It is unclear whether descriptions of psychiatric ghettos, cast as an outcome of poorly planned hospital discharges and based largely on a set of dated, small-scale studies, are still valid. The recognition of the importance of housing to the effective delivery of other mental health services and responses to the homelessness experienced by persons with psychiatric disability (Metraux, 2002) may have resulted in expanded housing opportunities and a less segregated distribution of this population. To address this question, this study assesses residential segregation in a large urban area using address infor-

mation from 15,246 people diagnosed with psychiatric disabilities and receiving Medicaid (MA) in Philadelphia, and an identically sized group of MA recipients serving as matched controls.

## DATA

The study and control groups were selected from an administrative database maintained by Community Behavioral Health, the publicly run managed care organization that funds behavioral health services for Philadelphia Medicaid recipients. This database contained eligibility data for all adult MA recipients in Philadelphia, and claims data for MA-reimbursed behavioral health services they used. We selected 80,598 observations from this database who were between ages 18 and 64 and who were eligible for MA for the entirety of 2000. In addition to this, to be considered for inclusion into the study group an observation must have had records of at least one inpatient or two outpatient MA-reimbursed services sometime between 1997 and 2000 for which the claims indicated ICD-9 diagnoses of either 295 (schizophrenia) or 296 (affective disorder). These are typically the central diagnoses included in defining severe mental illness, and the criteria for frequency of services received are consistent with other studies using Medicaid data to determine the presence of mental illness (Lurie, Popkin, Dyskin, Moscovice, & Finch, 1992; Blank, Mandell, Aiken, & Hadley, 2002). These criteria, used to indicate serious psychiatric disability, left 16,439 persons eligible for inclusion into the study group (Table 1).

In order to compare the distribution of addresses for persons with psychiatric disability to a similar population with no record of psychiatric disability, a control observation was selected for each of the observations in the study group (i.e., cases) from the same pool of 80,598 MA-eligible adults who had no records of any MA reimbursed claims involving ICD-9 diagnoses of 295 or 296. This matching of one control observation for each case observation was based on similar values for age, gender, race/ethnicity, and type of Medicaid eligibility. These matching criteria were used to determine propensity scores for each observation (case and control), scores that were derived from a logistic regression on the probability of an MA recipient being in the case group rather than in the control pool (Rubin, 1997; Smith, 1997). This matching method produced 15,888 matched pairs, or 96.6% of the observations that met the study-group criteria.

Using Arcview geographic information systems (GIS) software, the address information for each of the remaining study and control group observations was "geocoded" to produce coordinates that were mapped and located to census tracts. An additional 642 matched pairs had either a study group or control group observation with an address that could not be geocoded or was otherwise invalid, and as a result, the pair was discarded. As a result, the final study group (and case group) was composed of 15,246 observations, or 92.7% of the observations that initially met the study group criteria.

Table 1 provides descriptive statistics on basic demographic and clinical characteristics to provide a basic profile of the study and control groups, as well as those who were discarded from the case group due to either the inability to find a suitable match or the lack of a valid address. The case and control groups had identical distributions for all categories presented except for types of MA eligibility, where the difference in distribution had a nonsignificant chi-square value. Both groups were approximately two thirds female and had a median age of 42 (not shown on table), and almost 50% were of black (non-Hispanic) race, 25% of white (non-Hispanic) race, 11.5% of Hispanic descent, and a relatively high 13.1% of other or unknown race/ethnicity. In both groups, almost 75% of

**Table 1. Basic Demographic Measures and Clinical Characteristics for Persons Selected for the Study and Control Groups, and for the Observations Discarded from the Study Group.**

	<i>Study Group</i>	<i>Control Group</i>	<i>Discarded Observations</i>
Number	15,346	15,246	1,193
Gender			
Female	65.0%	65.0%	73.9%
Age Group			
18–29	13.9%	13.9%	6.4%
30–39	26.2	26.2	28.2
40–49	32.7	32.7	39.1
50–64	27.2	27.2	26.3
Ethnicity			
Black (non-Hisp)	49.8%	49.8%	22.6%
White (non-Hisp)	25.6	25.6	17.6
Hispanic	11.5	11.5	48.6
Other/Unknown	13.1	13.1	11.2
Type of MA eligibility*			
TANF-related	13.7%	13.7%	3.8%
SSI-related	73.2	72.5	83.6
GA-related	8.1	8.1	7.3
Other	5.0	5.6	5.3
Diagnoses			
Schizophrenia (295)	39.4%	n/a	30.9%
Affective disorder (296)	77.3	n/a	85.2
Types of Psychiatric Service			
Inpatient	33.4%	n/a	25.7%
Outpatient	94.6	n/a	91.3

\* MA eligibility is either in conjunction with eligibility under state-administered Temporary Assistance for Needy Families (TANF), federally administered Supplemental Security Income (SSI), state-administered General Assistance (GA), or through other means.

the persons were eligible for MA through Supplemental Security Income (SSI) eligibility and 13.1% through Temporary Assistance to Needy Families (TANF); much smaller proportions were eligible through General Assistance (GA) and other means. Finally, the claims data indicated that 39.4% of the study group was given a 295 (schizophrenia) diagnosis and 77.3% a 296 (affective disorder) diagnosis. One third of this group had a record of an MA-reimbursed psychiatric inpatient hospital stay, while nearly all received some type of MA-reimbursed outpatient services.

Although a relatively low 7.3% of the observations that met the study group criteria were not included in the ultimate study group, this group showed statistically significant differences, using chi-square tests, from the study group in all six categories shown on Table 1. The 1,193 omitted observations were, proportionally, more female, older, and

substantially more Hispanic. In addition, they had higher proportions of MA eligibility through SSI and lower proportions through TANF; lower proportions of persons with 295 diagnoses and higher proportions with 296 diagnoses; and lower proportions of both inpatient and outpatient psychiatric care.

The observations in the study and control groups were then aggregated by census tract, which produced a dataset with observations for each of the 381 census tracts that comprised Philadelphia County in the 2000 Census. Each tract-level observation had count totals of observations from both the study and control groups whose addresses were within its boundaries. In addition, 2000 Census data were used to determine, for each tract, the number of persons between the ages of 18 and 64, as well as the number of persons between the ages of 18 and 64 living in households with income under the federal poverty income guidelines. Subsequently, references to adult populations will be to the populations between the ages of 18 and 64.

## MEASURES OF SEGREGATION

The various methods by which to measure segregation that are presented in this section offer multiple perspectives for judging the extent of residential segregation in Philadelphia. The methods used include two—the index of dissimilarity and Moran's *I*—that provide one Philadelphia-wide value upon which to assess the extent of segregation. Additionally, there are three other methods—density maps, location quotients, and local indicators of spatial autocorrelation—that permit mapping the results and assessing the presence of more localized areas of concentration. These methods all are based upon the distributions of the study and control groups, and the total adult general and poverty populations as they were just described. Applying this array of measures to the study and control groups and assessing their respective distributions among both the general and poverty populations provides multiple dimensions upon which to assess residential segregation.

### *Index of Dissimilarity*

The index of dissimilarity, perhaps the most common measure of segregation, is an area-wide measure of evenness that describes the degree to which the proportional distributions of the two groups vary across the different units that comprise an area. Index of dissimilarity scores were reported here for pairings between four population groups: the study group, the control group, the adult general population, and the adult poverty population. The index of dissimilarity is derived from:

$$D = \frac{\sum_{i=1}^n [t_i |p_i - P|]}{2TP(1 - P)}$$

where  $t_i$  and  $p_i$  represent sizes of the total population and minority population, respectively, in geographic unit  $i$ , and  $T$  and  $P$  are the sizes of the total population and the minority population, respectively, in the overall geographic area. A score of 0 indicates an even distribution of the two groups across the geographic area, and a score of 100 indicates complete separation of the two groups. An index of dissimilarity score of  $X$  means that  $X\%$  of a group would have to move to a different geographic unit before there would be a completely even distribution in the overall geographic area (James & Taeuber, 1985; Massey & Denton, 1988).

Index of dissimilarity scores were computed using SAS statistical software. Table 2 shows a matrix of scores for various combinations among the populations considered. Reading the table rows, the study, control, and poverty populations all had very similar scores when they were set against the remaining general adult population. This suggests similar degrees of unevenness among the three groups. All three scores were just over 30, indicating that they were just above the common cutoff for judging a moderate degree of unevenness to be present. Predictably, the scores for the study and control groups both fell—to 21.7 and 19.2, respectively—and remained similar when they were cast against the poverty population. This suggests that both the study and control groups were distributed among the poverty population to the point where there was a relatively small degree of unevenness. Finally, the index of dissimilarity score decreased further, to 14.2, when the study group was compared to the control group.

### *Moran's I*

Moran's I, a measure of spatial autocorrelation in the distributions of the addresses among the study and the control groups, is the second area-wide analysis in this study. Distributions among geographical units, such as census tracts, are usually not independent, meaning that measures found in a particular unit are likely to be influenced by corresponding measures in nearby units. Moran's I measures this autocorrelation, with values approaching 1 when geographical units are situated near other similar geographical units, and approaching -1 when geographical units are situated near dissimilar geographical units. A Moran's I value of 0 indicates the absence of autocorrelation, or independence, among geographical units. Moran's I is calculated as:

$$I = (N/S_o) \sum_i \sum_j w_{ij} [(x_i - u)(x_j - u) / \sum_i (x_i - u)^2]$$

where  $N$  is the number of areas, in this case, census tracts;  $w_{ij}$  is each element taken from a spatial weights matrix;  $x_i$  and  $x_j$  are observations for areas  $i$  and  $j$  with mean  $u$ , and  $S_o = \sum_i \sum_j w_{ij}$  (Anselin, 1992; Odoi et al., 2003).

Moran's I values for this study were calculated using GeoDa GIS software with a binary spatial weights matrix where contiguous (i.e., first-order adjacency) tracts have a value of 1 and others a value of 0 (Anselin, 2003). The population rates of individual census tracts were standardized using a spatial empirical Bayes (SEB) smoothing procedure (Assunção & Reis, 1999) to correct for unevenness in population size across census tracts, and thereby satisfied the assumption of constant variance upon which Moran's I is predicated. Finally, a permutation process "in which a reference distribution is calculated for spatially random layouts with the same data (values) as observed" permitted generating pseudo  $p$ -values for assessing the statistical significance of the Moran's I values (Anselin, 2003, p. 91). Moran's I values were calculated for the study and control groups as rates of both the general adult population and the adult poverty population. Moran's I for the adult poverty population, as it is distributed among the general adult population, was also provided.

Table 3 shows values of global Moran's I scores for the populations included in Table 2. The study and control groups had similar values for their distributions in both the general population (0.294 and 0.316; first column of Table 2) and the poverty population (0.170 and 0.222; second column of Table 2). In both cases, the values for the study group were lower than those for the control group. By comparison, the Moran's I value

**Table 2.** *Index of Dissimilarity Measures for Combinations of Four Population Groups Aged 18 to 64 in Philadelphia PA: Persons Receiving Medicaid and Diagnosed with Psychiatric Disability (study group); Persons Receiving Medicaid with No History of Treatment for Psychiatric Disability (control group); Overall Population; and Population with Income Under Federal Poverty Guidelines*

	Study Group	Control Group	Poverty Population	Overall Population
Overall population	31.9	33.0	32.1	–
Poverty population	21.7	19.2	–	
Control group	14.2	–		
Study group	–			

**Table 3.** *Moran's I Values for Adults (ages 18–64) Receiving Medicaid and Diagnosed with Psychiatric Disability (study group); Persons Receiving Medicaid with No History of Treatment for Psychiatric Disability (control group); and Adults with Income Under Federal Poverty Guidelines (poverty population), as Rates of the (adult) Overall and Poverty Populations*

	Overall Population	Poverty Population
Study group	0.294	0.170
Control group	0.316	0.222
Poverty population	0.575	–

for the poverty population, as it was distributed in the general population, was 0.575, substantially higher than the corresponding values for the study and control groups. All these values were statistically significant ( $p < 0.01$  after running 999 permutations), and the values for the study and control groups indicate a moderate degree of spatial autocorrelation was present in the distribution of these groups across Philadelphia census tracts, even after taking poverty into account.

### **Density Maps**

Density maps express the distribution of point values over a surface, and are the only method presented here that does not use census tract boundaries. They also represent the rawest measure of local concentration, because these densities are presented without taking into account contextual factors, such as general population density or poverty levels. Instead, the density calculations spread point values over a surface by dividing an output map into equally sized cells and then applying a circular search area to each cell in which the number of point values determines the density value for each cell. A density map is then created, where progressively darker shades represent areas with heavier densities.

Density maps for this study were constructed using Arcview. To determine the degree of density for these maps, kernel density calculation was used, in which points (address locations) that fell within the search area were summed and then divided by the search area size to get each cell's density value. Points lying near the center of a cell's search area were weighted more heavily than those lying near the edge, in effect smoothing the distribution of values.



Figure 1, featuring density maps of the residential concentrations of people with and without psychiatric disabilities, shows that, although the study and control groups were most concentrated across similar, relatively broad areas of north Philadelphia, densities of control group observations appeared more dispersed throughout Philadelphia. Specifically, the control group had secondary concentrations in south Philadelphia and in north Philadelphia west of the primary concentration shared by both the study and control groups. This would suggest that the study group was more concentrated than the control group.

### *Location Quotient*

Location quotient (LQ) is another measure used to identify concentration within an area and is expressed as a ratio of the proportional share of the subjects at the local level (census tract) to the ratio of the total area covered (Philadelphia). Location quotient is expressed as:

$$LQ = (x_i/t_i) / (X/T)$$

where  $x_i$  represents the number of persons in group  $x$  (e.g., study group) in census tract  $i$ ;  $t_i$  represents the total population of persons (e.g., general or poverty) in the particular census tract  $i$ ; and  $X$  and  $T$  represent the city-wide number of persons in group  $x$  and population  $p$ , respectively.

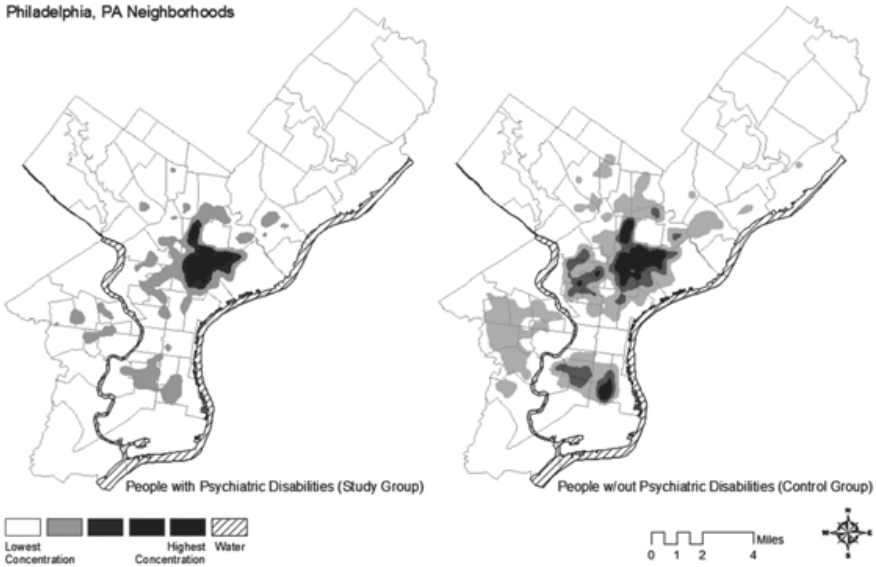
Location quotients for this study were calculated, and corresponding maps were constructed using Arcview. Figures 2, 3, and 4 indicate census tracts where the LQ was greater than 1, meaning those tracts that contained a higher percentage share of subjects of interest than Philadelphia as a whole. Figure 2 shows areas with elevated LQs for both the study and control groups based on using the overall population of adults as the denominator for both area and overall proportions. For both groups, the tracts with elevated LQs included the areas shown in Figure 1 to have had the highest unadjusted densities. Also, like Figure 1, there was a core area of concentration in north central Philadelphia for both groups and other scattered areas of substantial concentration (i.e.,  $LQ > 2$ ) for the control group that were not present for the study group. Figure 3 shows census tracts with high LQ values for the adult poverty population. Not surprisingly, the census tracts with the highest LQs for both the study and control groups in Figure 2 also contained disproportionate shares of poor adults.

Figure 4 shows LQs for the study and control groups using adults in poverty as the denominator, in effect showing LQ while controlling for poverty. Several features distinguished these results from those in Figure 2. First, the number of tracts with substantial concentration ( $LQ > 2$ ) was reduced, and second, the tracts with elevated LQs were more scattered across Philadelphia, and included areas that did not have an elevated poverty LQ (Figure 2). Although the distribution patterns were different among the study and control groups, there were no readily apparent patterns of difference between the distributions of LQs for these two groups.

Differences in the LQs between the study group and the control group also were apparent in a comparison of the 10 census tracts for each group that contained the largest raw numbers of group members. These 10 census tracts for each group overlapped substantially—7 tracts were shared by both groups, and all tracts were located in the high-density area common to both groups in north central Philadelphia shown

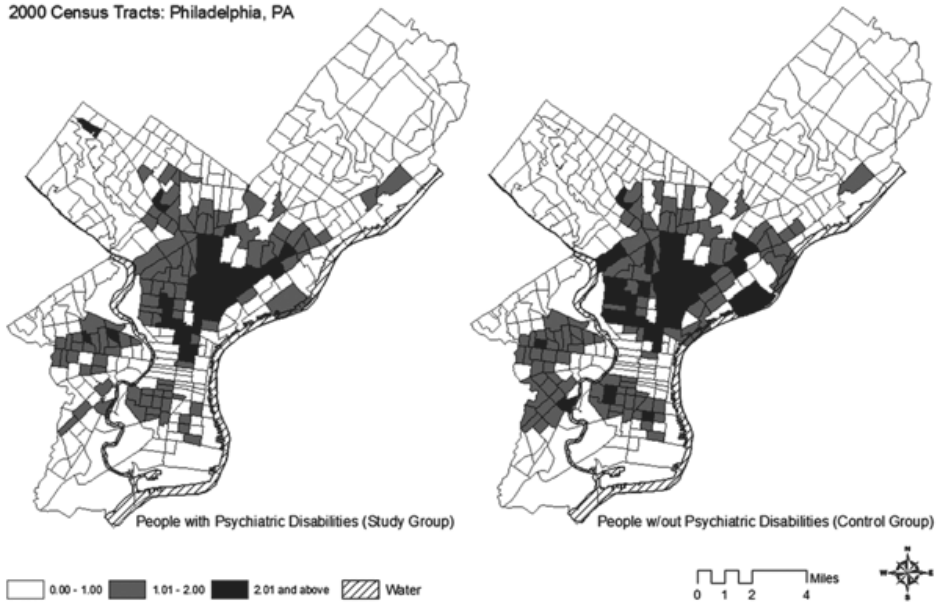


**Residential Population Density, Ages 18 to 64**  
Philadelphia, PA Neighborhoods



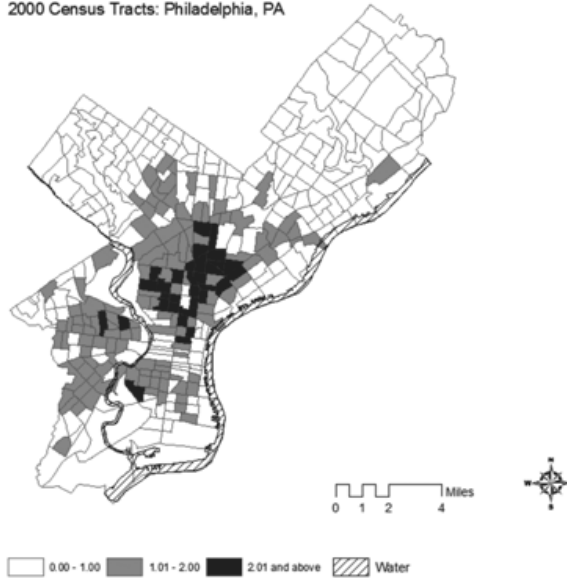
**Figure 1.** Density maps for adults (ages 18–64) receiving Medicaid and diagnosed with psychiatric disability (study group) and persons receiving Medicaid with no history of treatment for psychiatric disability (control group).

**Location Quotients, Ages 18 to 64**  
2000 Census Tracts: Philadelphia, PA



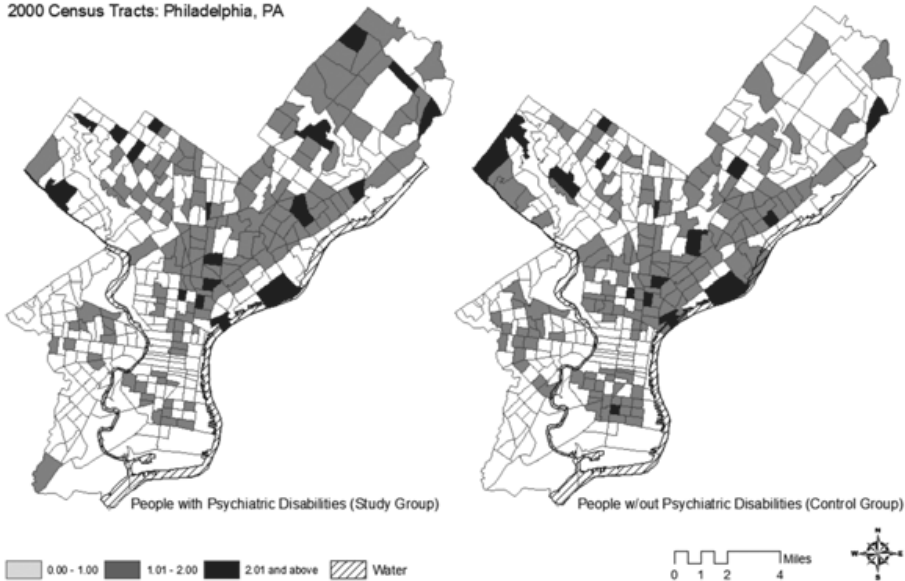
**Figure 2.** Location quotient values for adults (ages 18–64) receiving Medicaid and diagnosed with psychiatric disability (study group) and persons receiving Medicaid with no history of treatment for psychiatric disability (control group), based on their proportional representation among the overall adult population.

Location Quotients of the Poverty Population, Ages 18 to 64  
2000 Census Tracts: Philadelphia, PA



**Figure 3.** Location quotient values for adults (ages 18–64) living in households with incomes below the poverty threshold, based on their proportional representation among the overall adult population.

Location Quotients Controlled for Poverty, Ages 18 to 64  
2000 Census Tracts: Philadelphia, PA



**Figure 4.** Location quotient values for adults (ages 18–64) receiving Medicaid and diagnosed with psychiatric disability (study group) and persons receiving Medicaid with no history of treatment for psychiatric disability (control group), based on their proportional representation among the adult population living in households with incomes below the poverty threshold.

in Figure 1. For the study group, the 10 tracts contained 16.3% of the total group, but held only 8.9% of the total adult poverty population and 3.9% of the total adult general population. This yielded LQs of 1.8 (poverty population) and 4.1 (general population). In contrast, the corresponding 10 tracts for the control group contained 13.1% of the total group, and 9.4% and 4.3% of the total adult poverty population and the total adult general population, respectively. This yielded respective LQs of 1.4 and 3.0. Thus, although the census tracts that contained the most persons in the study group were largely the same tracts as those containing the most persons in the control group, closer examination of these tracts showed a higher concentration of study group members in these tracts.

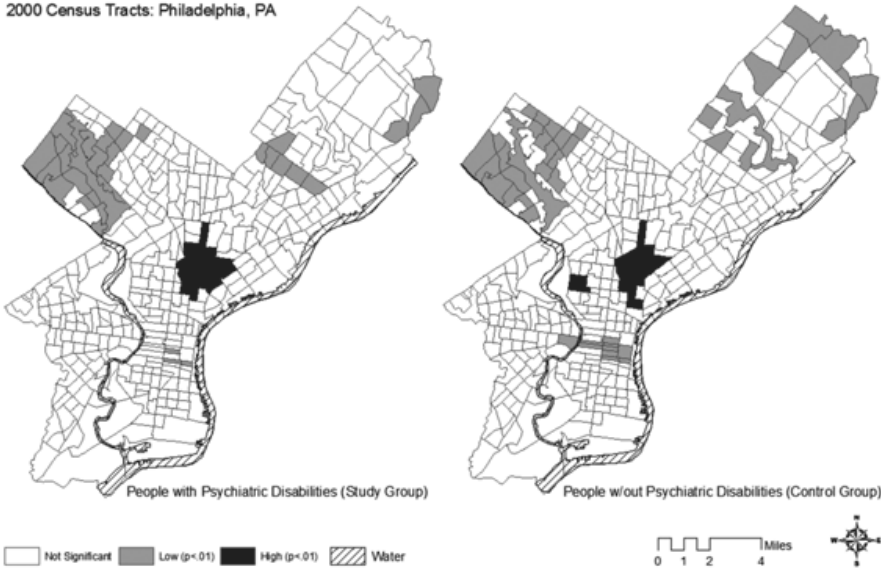
### *Spatial Clustering*

In order to locate clusters of residences for persons in the study and control groups, local indicators of spatial autocorrelation (LISA) were generated. LISAs represent the individual units' contributions to the overall Moran's I measure presented in Table 3 (Anselin, 1995). Statistically significant levels of autocorrelation in individual census tracts indicate spatial clustering, where high-value tracts are situated near other high-value tracts or low-value tracts are situated near other low-value tracts. Given the number of census tracts in Philadelphia (381), the cutoff value for determining statistical significance of these LISA values was raised to  $p = 0.01$  as an ad hoc means to reduce the likelihood of Type I errors, where the null hypothesis of no clustering is erroneously rejected (Anselin, Syabri, & Kho, 2004). Tracts with significant LISA values were identified using GeoDa, and mapped using Arcview to facilitate comparisons of patterns between the study and control groups.

Figures 5 and 6 show the locations of the census tracts that have statistically significant LISA values and thereby signal the presence of clusters of either high or low concentrations of either the study or control groups (depending on the map) when viewed as a rate of either the overall (Figure 5) or poverty (Figure 6) adult populations. In Figure 5, the largest high-value cluster of the study group was located in the same north-central Philadelphia area noted as densely populated and with high LQ values. The largest high-value cluster area for the control group overlapped substantially with that of the study group. The control group also had another smaller high-value cluster in two north Philadelphia tracts that were west of the primary cluster. The significant clusters of low concentration were also in the same parts of the city for both groups: the northeastern, northwestern, and Center City (i.e., "downtown") parts of Philadelphia. These areas all had LQs for poverty rates that were below 1.

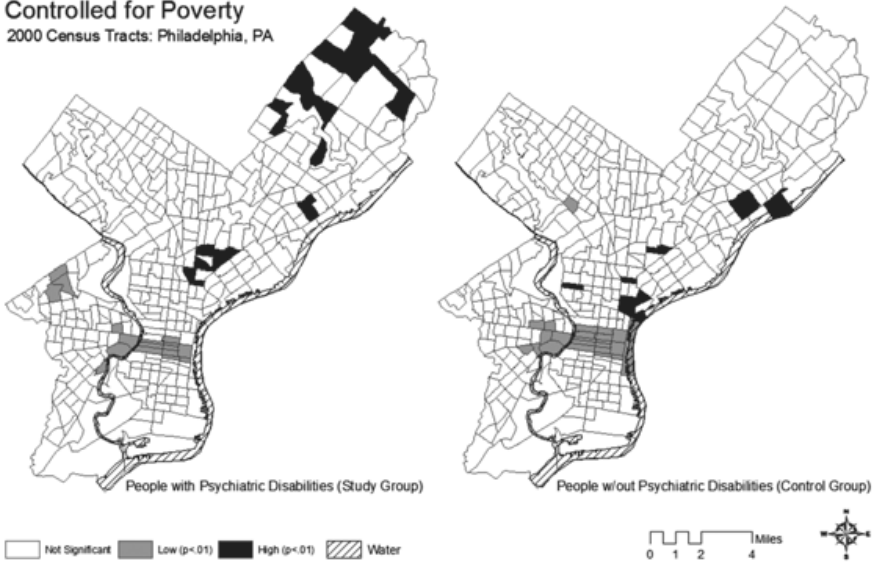
Figure 6 presents the tracts with significant LISA values for the study and control groups as they were distributed in the poverty population. After controlling for differential poverty rates in the tracts, there still was a statistically significant ( $p < 0.01$ ) high-density cluster for the study group in some of the same north Philadelphia tracts that comprised the principal cluster in Figure 5. Along with this principal cluster, other high-density clusters appeared in the northeastern part of Philadelphia, in tracts with low rates of both study group members and persons living in poverty. In contrast, the low-density clusters featured an expanded set of Center City tracts, as compared to Figure 5, and several scattered western Philadelphia tracts. As for the control group, there were fewer tracts in significant high-density clusters, with very little overlap either with the high-density clusters in Figure 5 or with those of the study group in Figure 6. The low-density cluster for the controls was lim-

LISA Levels of Autocorrelation, Indicating Spatial Clustering of Residences  
2000 Census Tracts: Philadelphia, PA



**Figure 5.** Census tracts with significant ( $p < 0.01$ ) local Moran's I values indicating clusters of tracts with either high or low rates of persons in the study group and the control group, both as rates of the overall adult population.

LISA Levels of Autocorrelation, Indicating Spatial Clustering of Residences:  
Controlled for Poverty  
2000 Census Tracts: Philadelphia, PA



**Figure 6.** Census tracts with significant ( $p < .01$ ) local Moran's I values indicating clusters of tracts with either high or low rates of persons in the study group and in the control group, both as rates of the poverty population.

ited to one large contiguous set of tracts that encompassed Center City and the near-western part of Philadelphia, overlapping and expanding upon a group of low-density tracts shown for the study group in Figure 6.

## DISCUSSION

This study has examined the extent of residential segregation among a large group of Medicaid recipients with psychiatric disabilities in Philadelphia. Using city-wide measures such as the index of dissimilarity and Moran's I, overall levels of residential segregation among this group were found to be modest at their most extreme, not markedly different from a control group of Medicaid recipients without any record of treatment for severe mental illness, and substantially reduced after taking poverty into account. Other analyses—density maps, location quotients, and LISA values—found localized areas of Philadelphia that had distinct concentrations of persons with psychiatric disability. Although concentrations of persons in the study and control groups happened in roughly the same areas, those areas of high concentration contained more persons from the study group than from the controls.

The primary finding—that there was a modest overall level of residential segregation among the study group—is consistent with one goal of mental health policy: to have persons with psychiatric disabilities living in a variety of locations throughout the city. Prior geographic studies would have predicted finding higher levels of residential segregation, but these results suggest that the orientation of community-based services for mental health treatment has brought a greater diffusion of this group within the community. However, caution should be taken before conclusively making such interpretations.

One issue to be considered is that the study group is not representative of the overall population of persons with psychiatric disability. The members of the study group all received treatment for a major mental illness—either through hospitalization or multiple outpatient services—that was reimbursed through Medicaid. Persons in this group can be considered to be low-income, because 95% were eligible for Medicaid in conjunction with their eligibility for SSI, TANF, or general assistance. As such, the study group did not include persons with psychiatric disability: (1) whose employment and other means of material support rendered them ineligible for Medicaid; (2) who were eligible for Medicaid and whose mental illness was disabling but who did not receive the diagnoses used in this study; (3) who received psychiatric services that were not reimbursed by Medicaid; (4) who received Medicaid-reimbursed psychiatric services but were unable to maintain Medicaid eligibility for one uninterrupted year; and (5) whose mental illness went untreated. Additionally, 1,193 persons, 7.3% of those who could have been included in the study group and whose characteristics differed from those of the study group, were excluded despite their Medicaid eligibility and psychiatric disability.

Although not representative of all persons with psychiatric disability, the persons in this study group, by virtue of their long-term receipt of Medicaid, their mental illness diagnoses, and their low income, represent a subgroup that is among the most vulnerable to stigma and limited residential opportunities. Furthermore, the 15,246 persons represented in the study group, although not representative of any larger group, do constitute a large group in and of themselves (1.7% of the overall adult population and 8.3% of the adult poverty population in Philadelphia). The size of this group and the

modest levels of residential segregation found among the study group would therefore portend even lower levels of residential segregation among the more general population of persons with psychiatric disability.

Having the study group be more representative, however, would have presented a clearer picture of the impact of poverty on residential segregation. The findings here suggest that “taking poverty into account” explains much of the residential segregation that was found, a finding that was expected because poverty, by itself, limits housing opportunities and is concentrated in certain areas (Jargowsky, 1997). In recognizing this, however, there is a danger that poverty gets dismissed too glibly as some type of extraneous factor when, in fact, psychiatric disability substantially elevates the risk of being impoverished (Cohen, 1993; Wilton, 2004).

Other factors also contribute to residential segregation that are not taken into account at all in this study. The factor perhaps most explored in conjunction with residential segregation is race, and although some research suggests that the intersection of race and psychiatric disability further impacts housing opportunities (Uehara, 1994), little is known on this topic. Another body of research suggests that the location of mental health services in the community is also a major source of concentration; that persons with psychiatric disabilities are more likely to live in proximity to clusters of such services (Dear & Wolch, 1987). The extent to which these and other factors contribute to the residential segregation found here also requires further research.

Another primary finding is that the residential patterns shown by the study group were very similar to those shown by a set of matched controls, suggesting that the residential segregation that was found could be explained by factors other than psychiatric disability. Although this is encouraging, the level of segregation in the control group represents merely a point of comparison, not an ideal to be reached. The presence of psychiatric disability may distinguish the two groups, but other similarities among the two groups—high levels of poverty, receipt of public income and medical assistance, and disability of some sort—may place the study and control groups in a larger, more inclusive rubric, such as what Wolch (1980; Dear & Wolch, 1987) has called the “service dependent poor,” membership in which may be associated with residential segregation. Neither of these groups, however, showed overall levels of segregation, as measured by the index of dissimilarity and Moran’s *I*, that were substantially greater than the levels of the undifferentiated adult poverty population.

Despite the absence of high levels of residential segregation as shown by overall measures, there do seem to be some localized concentrations of study group observations. The primary concentrations of both study and control group observations, as shown on density, LQ, and LISA maps, occurred primarily in north central Philadelphia census tracts in an area also marked by high levels of poverty. Even after taking these high rates of poverty into account, the study group still clustered in some of these census tracts. This clustering appears to have occurred to a greater extent among the study group than among the control group. All of this suggests that, despite the absence of high overall levels of residential segregation, there may be a subgroup in the study group that remains at higher risk for the type of “ghettoization” described in the previous literature. Examining the census tracts with the highest numbers of study group observations showed that approximately one sixth of the study-group remained concentrated in areas where their representation substantially exceeds levels shown by the control group or the adult poverty population. This study merely points out the possible existence of such a group; further research should examine this topic, and, more generally, the extent to which persons with psychiatric disability are at higher risk of living in neighborhoods featuring specific social, economic, and physical characteristics.



This also underscores that one advantage of this study, the number of observations included in the study group, also carries limitations. Persons with psychiatric disabilities are not a monolithic group, and dynamics such as residential segregation are likely to affect different subgroups among this study group differently. Race has already been mentioned as one such dimension, and type and severity of psychiatric disability, not differentiated in this study, may be another dimension. Just as residential segregation serves as a crude but prerequisite measure of community integration, so should the residential patterns of this study group be seen as a crude indicator of segregation levels among subgroups within this group.

And finally, the absence of high levels of segregation on the census-tract level cannot rule out the presence of concentrations of persons with psychiatric disabilities in smaller areas, such as on particular blocks or in clusters of proximate community residences. These findings also cannot contribute insights on the disagreement between proponents of competing housing paradigms over whether multiunit housing exclusively for persons with psychiatric disability, such as community residences, constitutes a barrier to community integration (Metraux, 2002).

Given these qualifications, the absence of high levels of residential segregation found here should be interpreted positively, albeit cautiously. Psychiatric disability may present a protective factor, where housing opportunities available through the mental health services system may have a secondary, facilitating effect toward dispersing persons with psychiatric disability throughout the community in a manner that was previously not possible due to the stigma and poverty associated with psychiatric disability. Another possible factor is that the reduced incidence of community reentry of persons following long stints in psychiatric hospitals, a process that marked the previous decades as the era of deinstitutionalization, has created a situation where persons with psychiatric disabilities have stronger ties to their local communities that leave them less vulnerable to being shunted into specific neighborhoods. Yet this study also shows that residence patterns of the study group are still linked to their poverty. Thus, one aim of community responses to psychiatric disability should be to continue to lessen the magnitude of such an association so that psychiatric disability is not accompanied by an increased vulnerability to poverty and that, regardless of socioeconomic status, all persons with psychiatric disability have access to a range of housing options so that they need not be clustered in specific neighborhoods.

## CONCLUSION

This is one of the few recent studies to systematically examine the geographical dimension of community integration among persons with psychiatric disability. In doing so, it not only provides findings that can be incorporated into a larger body of research on community integration, but also showcases the ability of spatial analysis methods to assess ecological correlates and their relationships to various aspects of community mental health. This encompasses a wide range of topics focusing on the interaction of persons with psychiatric disabilities and their physical and social environments, including questions related to residential segregation that were examined in this study; assessing environmental dynamics and their effects on mental health; and evaluating how persons with psychiatric disability access various community services. These geographic applications have the potential to better inform both research and practice in the tradition of the earliest community mental health studies of Edward Jarvis (Grob, 1978) and Faris and Dunham (1939).



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