

Indicators Predicting Use of Mental Health Services in Piedmont, Italy

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Abstract

Background: Since the 1978 Italian reform, an integrated network of community mental health services has been introduced. With few exceptions, research on determinants of mental health service use at the district level has focused on inpatient activities and social deprivation indicators. The European Psychiatric Care Assessment Team (EPCAT) standardized methodology allows for an evidence-based comparison of mental health systems between geographical areas.

Aims: To compare service provision and utilization between local catchment areas; to explore quantitative relationships between residential and community service use and socio-demographic indicators at the ecological level.

Methods: The European Socio-demographic Schedule (ESDS) was used to describe area characteristics, and the European Service Mapping Schedule (ESMS) to measure service provision and utilization in 18 catchment areas in Piedmont.

Results: Substantial variation in service use emerged. Acute hospital bed occupancy rates were lower in areas with more intensive community continuing care service users and with a smaller percentage of the population living alone. The non-acute hospital bed occupancy rate was directly related to the percentage of the population living alone or in overcrowded conditions, and to the level of mobile continuing care service users. Community continuing care service use was highest in areas with a larger percentage of the population living alone.

Discussion: Multiple regression models explained between 48 and 55% of the variation in inpatient and community service use between areas. Relationships based on ecological characteristics do not necessarily apply to the individual. This level of assessment, however, is necessary in evaluating mental health policy and service systems, and in allocating resources.

Implications for Health Care Provision and Use: The distribution of mental health care resources should be weighted in terms of

indicators of social deprivation shown to be important predictors of both inpatient and community service use, as these are likely to be related.

Implications for Health Policies: To ensure horizontal equity in access to mental health care, particularly for people with severe mental illness, evaluation of mental health policy should be based on a concurrent evidence-based assessment of the organization and use of both residential and community services, in relation to area level indicators of social deprivation.

Implications for Further Research: Cross-national research using an internationally standardized methodology should consider the influence of the social network independently of other socio-economic indicators, to verify the relative importance of this in predicting service use in southern and in northern European countries.

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Introduction

The World Health Organization has focused its programme in the field of mental health care on defining worldwide organizational standards for psychiatric care.^{1,2} A central role is envisaged for community mental health care within integrated social and health networks. Many European countries have embraced community care, although at different times and with a variety of approaches.

The 1978 Italian mental health reform and resulting policy documents³ detailed the requirements for community mental health care, replacing the existing hospital-based system. By the end of the 1990s, all public mental hospitals had closed except for six forensic institutions with about one thousand beds in total. Under the National Health System, an integrated network of mental health services has been implemented at the local level. Overall, the Italian reform has been judged favourably,⁴⁻⁷ although there is evidence that its application has not been uniform across geographical areas with respect to the provision of community services.^{8,9}

The literature on instruments for assessing mental health service networks based on a uniform method of classifying services remains limited.¹⁰⁻¹² The recently developed EPCAT internationally standardized methodology allows for

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an evidence-based comparison of mental health systems between regions or countries.¹³⁻¹⁶ The EPCAT approach develops investigation of mental health services within the conceptual framework defined by Thornicroft and Tansella's Matrix Model.¹⁷ It provides a technology for detailed evaluation of important characteristics of the local area population, structural components of the mental health system, and service use at the local catchment area level, in which the focus is on the organization and utilization of services rather than on individual outcomes. This district level of assessment is necessary in evaluating mental health policy and service systems (organization and delivery of services), and in allocating resources to local health authorities.

With few exceptions, research on determinants of mental health service use at the district level, mainly in the UK and northern Europe, has focused on inpatient admission activities and social deprivation indicators.¹⁸⁻²² There is evidence linking psychiatric admissions to rates of unemployment, poverty and residential mobility, while the association between population density and mental health services use is more tenuous.²³⁻²⁸ This evidence based on predictors of psychiatric admissions has influenced UK resource allocation formulae. The focus on use of psychiatric beds is open to criticism, given the growing importance of community services in psychiatry and the serious conceptual problems with indicators derived from modelling inpatient admission activities alone.²⁹⁻³¹ Some attempts have been made at exploring relationships between utilization of community services and population based socio-demographic indicators; and finally, at including these "community predictors" into new versions of the allocation formulae.³²⁻³⁴ Data on community service use, however, are often either unavailable or not comparable to data available on inpatient admissions.^{25,32,34}

This is the first large-scale regional investigation in Italy aimed at quantifying relationships between mental health service use, and indicators of social deprivation at the ecological level. In Italy, as in many European countries, psychiatric case-registers are scarce. The EPCAT methodology was used to generate comparable data on inpatient and community services that can be used to supplement routinely collected databases.

Given that the Italian mental health reform, under pressure from political and humanitarian movements, laid the foundation for a potentially equitable allocation of mental health resources our first objective was to assess the level of homogeneity between local catchment areas in characteristics of the service system and in service utilization. The second aim was to explore quantitative relationships between residential and community services use, and well-documented socio-demographic indicators. We predicted that utilization of residential services would be related to the level of development and utilization of community services, after accounting for area socio-demographic differences.

Methods

Setting

One of 20 Italian regions, Piedmont is located in the north-western part of the country bordering on France and Switzerland. The population of 4.3 million is distributed over 1,206 communities with an average density of 160 inhabitants per km². Employment levels and mean per capita income exceed national averages. In recent years, unemployment rates have been consistently well below national (8.5%) and euro-zone (9.0%) levels.³⁶

Piedmont has 22 health service catchment areas, four of which are located in Turin, the only metropolitan centre. The areas surrounding Turin are mainly urban-suburban in character, while other smaller urban centres are surrounded by vast rural areas with smaller communities and villages. The remaining catchment areas are predominantly rural, some with large mountainous territory.

All 22 local health authorities were required to establish a Mental Health Department as defined in the original planning at the national level⁴ and enacted by the regional government, with strict adherence to the nation-wide political reform of the mental health system. Mental health services available in the region have been thoroughly described elsewhere.^{37,38} In addition to the public services offered directly by each Mental Health Department, there are publicly funded private providers who supply about two-thirds of all hospital beds and half the beds in non-hospital residential facilities.

Publicly funded health care services are managed by the local health authority in each catchment area, and serve an average population of 194,895 ranging from 86,265 to 364,924. A comprehensive range of services is typically situated within the geographical boundaries of every area, and citizens are entitled to free access to essential health care services. Equitable access is promoted by encouraging patients to use the services provided within their catchment area or located nearby.

In 2001, public expenditure by the regional government on psychiatric care was about five percent of the health budget. Funding has historically been negotiated at the local health area level by health administrators and directors of mental health departments, on the basis of perceived need for services. **Figure 1** is a graphical representation of the distribution of per-capita spending on mental health services in 2002, showing the variation in mental health budgets determined by this unregulated process of local negotiations. A clear trend emerges: with few exceptions, higher levels of spending in the metropolitan centre of Turin and surrounding areas.

Measures

The EPCAT methodology consists of instruments for the standardized description and quantitative assessment of secondary mental health care services provided for adults aged 18 to 65 years with mental or behavioural disorders.

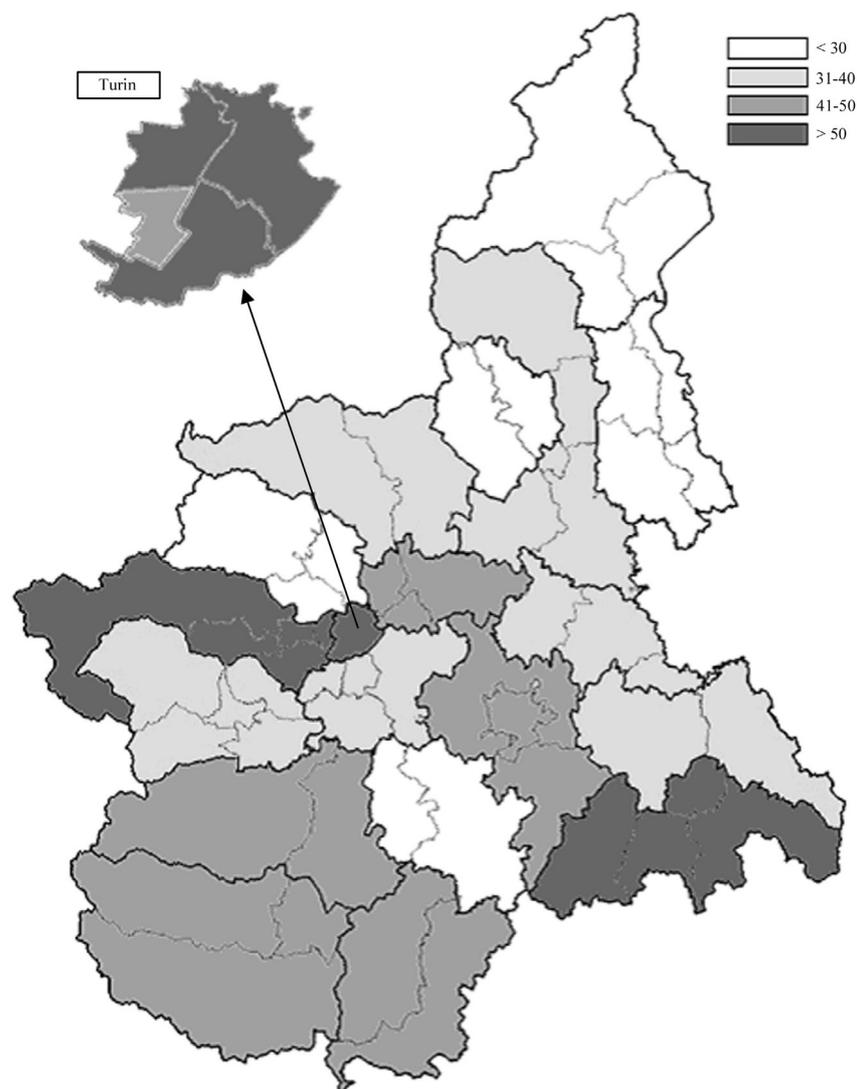


Figure 1. Per-Capita Spending on Mental Health Services in Piedmont (euros per year 2002).

Source: Regional Office for Mental Health, 2003

Two instruments were used in this study:

- (i) European Socio-Demographic Schedule (ESDS) for recording socio-demographic indicators on the population of a geographical catchment area.¹³
- (ii) European Service Mapping Schedule (ESMS) for the description and classification of basic patterns of care within each catchment area (section B), and for measurement of service utilization over a one-month period (section C), with a listing of available services (section D) through use of a mapping tree.¹⁴

There are three main categories of service provision defined in the ESMS into which services are classified based on their function: residential services; day and structured activity; and outpatient services. The instrument includes operational definitions of all service types, along with detailed guidelines for counting provision and utilization of each. **Table 1** provides a brief description of the variables on which data

were collected, and the measure of utilization used to count service contacts.

Service contacts were counted for users of all publicly funded secondary mental health services. In Piedmont, between 50 and 70% of users have a diagnosis of either schizophrenic, bipolar affective or personality disorders. Occupancy of non-hospital residential beds is almost entirely by these diagnostic groups, and in general hospital psychiatric beds the numbers are approximately 60% for non-acute care and 80% for acute care. General practice prescription patterns in Piedmont show that general practitioners play an important role in managing depressed patients as they prescribe 80 to 90% of all anti-depressants, but only a small percentage of prescriptions for anti-psychotics.^{39,40} Their involvement in managing individuals with severe mental illness is limited, as all individuals with a potential diagnosis of a psychotic disorder are referred to a mental health specialist.

Table 1. Description of ESDS and ESMS Variables

ESDS – European Socio-Demographic Schedule (data collected on local area population)

Number of inhabitants
 Size of catchment area
 Predominant character (metropolitan, urban, rural, etc)
 Gender distribution
 Age structure
 Employment categories (for population between 16 and 64 years)
 Percentage (over 16 years) who are single, widowed, or divorced
 Percentage (over 16 years) who are living alone
 Percentage (over 16 years) who are lone parents
 Percentage (over 16 years) living at a different address one year prior to data collection
 Percentage overcrowding (private households with more than one person per room)
 Standardized mortality rate for all causes and ages
 Standardized mortality rate for all causes for people under 65 years

ESMS – European Service Mapping Schedule (data collected during a one-month census)

Residential Services – *mean number of occupied beds at any one time*

Hospital beds (acute) – in general hospitals
 Hospital beds (non-acute) – in private inpatient facilities
 Non-hospital residential beds (acute) – community-based – *not available in Piedmont*
 Non-hospital residential beds (non-acute) – community-based
 Time limited – maximum length of stay is fixed for at least 80% of patients
 24-hour support – staff present 24 hours a day
 Daily support – staff regularly present at least five days a week
 Limited support – staff regularly present fewer than five days per week
 Indefinite Stay – does not meet the criterion for time limited (24-hour, daily, or limited support)

Day Services and Structured Activity

Acute day services^a – *mean number of users per working day*
 Non-acute day services^b – *total number of users*
 High-intensity – patients attend for at least the equivalent of 4 half-days per week
 Low-intensity – patients attend for less than the equivalent of 4 half-days per week

Outpatient Services

Emergency services^c – *total number of contacts*
 Mobile – at least 20% of contacts take place off-site (24-hour or limited hours)
 Non-mobile – does not meet the criteria for mobile (24-hour or limited hours)
 Continuing care services^d – *total number of users*
 Mobile
 High-intensity – contact at least three times per week is possible
 Medium-intensity – contact at least once a fortnight when indicated
 Low-intensity – regular contact less frequently than once a fortnight
 Non-mobile
 High, medium and low-intensity

^a Admission usually available within 72 hours to alleviate deterioration

^b Work and work-related; other structured activities and social contact

^c Same day response to provide assessment and initial treatment due to deterioration

^d Services that provide regular face-to-face contact that may be long-term

Data Collection

This cross-sectional study was carried out in 18 of the 22 Piedmontese local catchment areas. All except one catchment area agreed to participate in this study. However, the data supplied by three areas were not included as they were gathered using a pilot version of the ESMS. These catchment areas, two of which are metropolitan, do not differ substantially from the remaining 18 in terms of the network of psychiatric services.³⁷

Data on service provision (ESMS – section B) were obtained directly by the researchers through interviews with the director of each Mental Health Department. All services routinely serving the local catchment area population were included even if located outside the area, the inclusion criterion being a minimum of five service contacts by residents of the area over the past year. Mental health staff at each facility in collaboration with the researchers, collected the service utilization data (ESMS – section C) during a one-month census of service contacts, and the ESMS data on socio-demographic variables were obtained from the 1991 census (Ufficio Statistica Piemontese, Censimento 1991).

Data Analytic Procedures

This study was at the catchment area level, thus inferences apply to the catchment areas rather than to individuals. A cluster-level analysis was carried out using standard statistical methods on summary measures that represent service utilization rates per 100,000 of local population based on counting service contacts at the individual level.

Multiple linear regression models were used to investigate relationships between residential and community service use, socio-demographic indicators of social deprivation and service provision. Separate regression analyses were performed on six response variables that represent distinct aspects of the mental health care system as defined in the ESMS. In fitting the regression models, potential explanatory variables included (i) four socio-demographic indicators: density, percentage of local population living alone, percentage living in overcrowded conditions, and male unemployment rate, and (ii) service provision and utilization measures chosen on the basis of hypothesized patterns of service use resulting from increased provision of community services. **Table 2** provides definitions of all response and explanatory variables included in these analyses.

The same strategy was followed to identify the best model in each analysis, including an assessment of multicollinearity in selecting potential explanatory variables and the usual diagnostic checks on model adequacy. Mallows' Cp statistic was used to choose among all possible regression models with preference given to models having the smallest Cp value, as these models minimize the average error of prediction.⁴¹ Since socio-demographic characteristics are a common source of confounding, we considered the effect of potential confounding variables on the estimates of the regression coefficients in the best subset model. Adjusted estimates of the regression coefficients were obtained by retaining a potential confounder in the model, if its removal

resulted in a change of more than ten percent in one or more of the coefficient estimates.⁴² S-Plus and SAS were used to perform the analyses, in which a significance level of 0.05 was adopted. We made no adjustments for multiple testing.

Results

Variations in Levels of Service Provision, Utilization, and Socio-Demographic Indicators

Service Provision

Mental health services available in every catchment area include acute and non-acute hospital beds, non-hospital residential beds with 24-hour staffing, acute day services, and mobile outpatient services in which contacts take place at patients' homes. Day centres are available throughout the region; the vast majority were classified as 'high-intensity' where patients may attend for at least the equivalent of four half-days per week, and most offer structured individual and group activities. More flexible social contact activities are also widely available; work and work-related interventions are absent in only three areas. Almost all areas have community continuing care services that meet the ESMS criterion for 'mobile' with at least 20% of their contacts taking place outside mental health service premises, and for 'high-intensity' with the capacity to see users three or more times per week.

In most areas there is a well-developed network of services, but often the actual numbers of services are small. This is especially true for non-hospital residential beds with daily or limited support, in which staff is routinely on site not more than 5 days a week; provision of these service types and 24-hour mobile emergency services is uneven across the region. Only in the metropolitan city of Turin, with 950,000 inhabitants, there is a 24-hour mobile psychiatric emergency service linked to the public health emergency phone number serving all four metropolitan catchment areas.

Residential Service Use

There was considerable regional variation in the use of both hospital and non-hospital residential beds. **Table 3** shows residential service utilization rates per 100,000 of local population, which represent the mean number of occupied beds at any one time during the one-month census period. Acute care hospital bed occupancy rates ranged from 1.1 to 15.1 beds per 100,000, with a regional average of 6.7 (SD=3.8) occupied beds. Non-acute care hospital bed occupancy rates varied widely across the region, from zero in five areas to an extreme value of 36.9 per 100,000 in Torino Centro, with a mean of 6.7 (SD=10.1) and a median of 3.2 occupied beds. When we considered all hospital beds together, providing both acute and non-acute care, the highest occupancy rate of 48.0 beds per 100,000 in Torino Centro is over three standard deviations above the regional average of 13.4 (SD=11.3); the median is 8.9 occupied beds.

In almost every area, non-hospital residential bed use

Table 2. Response and Explanatory Variables

Response Variables	Description
Hospital beds (acute)	Mean number of occupied hospital beds for acute care (Beds used for short-term emergency admissions in general hospital wards)
Hospital beds (non-acute)	Mean number of occupied hospital beds for non-acute care (All other hospital beds in subsidized private inpatient facilities)
Non-hospital residential beds (non-acute)	Mean number of occupied non-hospital beds for non-acute care
Day services users (non-acute)	Total number of users of day services for non-acute care
Emergency contacts	Total number of contacts for emergency services
Continuing care users	Total number of users of continuing care services (on caseload)
Explanatory Variables	
Density	Population per square kilometre of local area
Percent Living Alone	Percentage of local population over school leaving age (16 yrs) living alone with no other adults and no dependents
Percent Overcrowding	Percentage of all private households in the local area containing more than one person per room
Male Unemployment Rate	Unemployed males over school leaving age / Economically active males in the local area
Percent mobile emergency contacts	Mobile emergency contacts (seen outside MH premises) / Total number of contacts for emergency services
Percent mobile continuing care users	Mobile continuing care users (seen at least once outside MH premises) / Total number of users of continuing care services
Percent non-hospital residential beds	Mean number of occupied non-acute non-hospital beds / Mean number of occupied non-acute (hospital and non-hospital) beds
Percent high-intensity continuing care users	High-intensity continuing care users (seen 3 or more times per week) / Total number of users of continuing care services
Percent vocational day services users	Day services users involved in work or work-related activities / Total number of users of day services
Percent day services users	Day services users / Total number of users of day and continuing care services
Acute day facility availability	Presence/absence of day facility for acute care
Non-acute day services availability	Availability of non-acute day services (rate per 100,000)
Continuing care services availability	Availability of continuing care services (rate per 100,000)

Note: Utilization rates per 100,000 local area population unless otherwise specified, based on a one-month census

accounted for over 55% of all residential services use; the regional average is 73%, ranging from 24% in Verbania to 96% in Orbassano. Over 75% of all non-acute residential care occurred in non-hospital residential beds, except in four areas. However, variation in utilization rates was large, ranging from 5.8 to 74.0 beds per 100,000; the regional average is 40.7 (SD=22.1).

Community Service Use

Community services include acute day services, intended to divert patients from hospital in a crisis; non-acute day services offering social contact and other structured activities, as well as vocational rehabilitation programs providing work and work-related activities; and emergency and continuing care services. **Table 4** shows community service utilization rates per 100,000 of local population. Substantial regional variation emerged.

Only ten catchment areas reported utilization of acute day services, counted as the mean number of service users

present on any working day during the month, with an average of 4.3 (SD=4.6) users per 100,000. Utilization of non-acute day services, measured as the total number who used these services in one month, occurred in every area with wide variation from 11.1 to 103.7 users per 100,000. The mean for the region is 52.6 (SD=23.7) users.

The number of emergency contacts during one month, ranged from 16.1 to an extreme value in Alessandria of 173.1 per 100,000, which is three standard deviations above the mean; the regional average is 71.5 (SD=33.6) contacts. The percentage of emergency contacts classified as 'mobile', usually taking place in patients' homes, varied from 11.3% to 80.5% with an average of 41.7% across the region.

Community continuing care service use ranged from 244.2 to 921.6 users per 100,000 in one month, with a mean of 534.9 (SD=198.3) users. Service users were defined as 'mobile' if they had at least one contact with staff outside mental health services premises during the past month and as 'high-intensity' if they had at least three contacts with staff in the space of a week (excluding day service attendance).

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Table 3. Residential Services Utilization Rates (Mean number of occupied beds per 100,000 local area population)

Local Catchment Area	Residential Services							
	Acute Care		Non-acute Care			Total Beds (Acute & Non-acute)		
	Hospital Beds	Hospital Beds	Non-hospital beds		Percent Non-hospital Residential Beds	Hospital Beds	Non-hospital Beds	Percent Non-hospital Residential Beds
		Time Limited	Indefinite Stay					
Torino centro	11.1	36.9	24.6	39.9	63.6	48.0	64.5	57.3
Torino sud	4.2	17.0	17.0	33.5	74.8	21.2	50.5	70.4
Orbassano	2.7	0.0	23.0	51.0	100.0	2.7	74.0	96.4
Chivasso	1.1	7.9	25.4	31.3	87.7	9.0	56.7	86.3
Moncalieri	2.8	3.5	23.1	20.3	92.5	6.3	43.5	87.3
Pinerolo	7.7	0.0	0.0	11.6	100.0	7.7	11.6	60.0
Vercelli	4.5	4.5	28.4	0.0	86.4	8.9	28.4	76.1
Biella	2.2	4.5	20.0	1.1	82.6	6.7	21.1	76.0
Novara	3.4	0.6	3.8	3.1	91.7	4.0	6.9	62.9
Verbania	15.1	2.9	5.8	0.0	66.7	18.0	5.8	24.4
Cuneo	7.2	0.0	32.8	6.6	100.0	7.2	39.4	84.5
Mondovi	12.7	1.2	42.9	0.0	97.4	13.9	42.9	75.5
Savigliano	9.4	0.0	25.7	27.5	100.0	9.4	53.2	85.0
Alba	7.6	24.8	19.7	6.4	51.3	32.4	26.1	44.6
Asti	7.5	12.1	66.0	0.0	84.5	19.6	66.0	77.1
Alessandria	5.9	0.0	17.7	0.0	100.0	5.9	17.7	75.0
Casale	6.8	1.7	7.7	49.6	97.1	8.5	57.3	87.0
Novi Ligure	8.4	3.5	14.1	52.7	95.0	11.9	66.8	84.8

Mobile continuing care users ranged from 62.5 to 208.9 per 100,000 with a mean of 112.9 (SD=39.3) users. The majority of users were seen on mental health service premises: the percentage of mobile users ranging from only 8.5% to 36.6%. The rate of high-intensity users varied widely from 10.6 to 199.9 per 100,000; the regional average is 66.4 (SD=48.0) and the median is 52.0 users. The percentage of high-intensity continuing care users ranged from under 5% in four areas to over 20%.

Socio-demographic Indicators

The six socio-demographic variables shown in **Table 5** were selected from the ESDS based on their relevance to mental health service use in Piedmont, and on their availability and reliability. Two of these (the percentage single, widowed or divorced; and the percentage of the local population over 64 years) were not considered in the regression analyses due to multicollinearity: the four remaining socio-demographic variables explained over 85% of the variation in these indicators.

The metropolitan catchment areas, Torino Centro and Torino Sud, have a distinct profile. They are densely populated with approximately 6,000 and 15,000 inhabitants per km² compared with densities ranging from 58 to 360 inhabitants per km² in the rest of the region. Torino Centro has the largest percentage of its population living alone

(14.7%), followed closely by Mondovi (13.9%) and Torino Sud (12.7%). The highest male unemployment rates are in the four Turin catchment areas, with Torino Centro (11.7%) and Torino Sud (10.0%) levels slightly below the others. Overcrowding is also above average in Turin and surrounding areas: sample values ranging from 12.9 to 14.4% of the local population living in overcrowded conditions compared to the next largest value of 7.5% in Pinerolo.

Relationships Between Service Use and Socio-Demographic Indicators

Utilization of both inpatient residential and community services was predicted by area socio-demographic characteristics and, moreover, inpatient service use was related to local community service use. **Table 6** summarizes the significant predictors of service utilization rates identified for each response variable.

Residential Services

Hospital Beds (Acute Care)

Our hypothesis was that lower levels of acute care in general hospital beds would be associated with relatively intensive community service provision, after adjusting for area socio-

Table 4. Community Services Utilization Rates (per 100,000 local area population)

Local Catchment Area	Community Services								
	Day Services and Structured Activities			Outpatient Services					
	Acute Day Services ^a	Non-acute Day Services ^b	Emergency Services ^c	Percent Mobile Emergency Contacts	Continuing Care Services ^d	Mobile Continuing Care ^d	High-intensity Continuing Care ^d	Percent Mobile Users	Percent High-intensity Users
Torino centro	0.0	92.5	73.7	35.4	658.8	154.7	95.2	23.5	14.5
Torino sud	0.0	70.4	100.1	25.9	921.6	92.1	199.9	10.0	21.7
Orbassano	0.0	31.5	75.4	11.3	404.5	72.6	47.1	18.0	11.7
Chivasso	0.0	58.8	40.3	51.3	299.9	65.2	53.5	21.7	17.8
Moncalieri	7.4	103.7	64.5	56.5	350.4	128.3	41.0	36.6	11.7
Pinerolo	0.0	57.3	74.3	47.9	807.9	208.9	31.0	25.9	3.8
Vercelli	2.2	45.7	38.5	20.3	559.8	122.7	77.5	21.9	13.9
Biella	1.1	76.3	57.3	70.9	435.8	96.8	123.6	22.2	28.4
Novara	1.3	31.2	81.2	17.3	244.2	62.5	10.6	25.6	4.4
Verbania	0.0	11.1	70.5	57.9	827.7	136.3	62.9	16.5	7.6
Cuneo	0.0	39.4	43.3	19.7	441.4	70.8	50.5	16.1	11.4
Mondovi	16.2	58.0	95.1	80.5	549.5	125.2	70.7	22.8	12.9
Savigliano	4.4	53.2	65.7	32.4	423.1	87.7	18.8	20.7	4.4
Alba	1.9	51.6	93.0	38.4	379.4	138.8	43.3	36.6	11.4
Asti	1.0	22.7	16.1	78.1	407.0	126.4	26.2	31.1	6.4
Alessandria	0.0	32.8	173.1	18.6	653.8	153.8	98.4	23.5	15.0
Casale	3.4	44.4	46.2	64.8	785.4	66.7	18.8	8.5	2.4
Novi Ligure	4.2	66.8	78.8	24.1	478.1	122.3	126.6	25.6	26.5

^a Mean number of users per day^b Total number of users in one month^c Total number of contacts in one month^d Total number of users in one month

Table 5. Local Catchment Area Socio-Demographic Characteristics

	Mean	Std Dev	Median	Min	Max
Density (inhabitants per km ²)	1309.0	3654.9	141.0	57.6	14775.4
Percent living alone	10.6	2.2	10.8	6.6	14.7
Percent overcrowding	7.3	4.1	5.8	3.0	14.4
Male unemployment rate	7.4	1.9	7.6	4.3	11.7
Percentage over age 64 years	21.0	3.1	21.0	15.4	26.2
Percentage single, widowed, or divorced	34.9	1.6	31.6	31.6	37.7

demographic indicators of social deprivation. This was anticipated because more intensive service provision in the community should allow other forms of service, such as outreach interventions, to be substituted for acute hospital care. This was confirmed: the acute hospital bed occupancy rate was significantly lower in catchment areas with a larger percentage of high-intensity continuing care service users and a smaller percentage of the local population living alone. This model explains 53% of the variation in use of acute hospital beds ($R^2 = 0.527$).

Hospital Beds (Non-Acute Care)

It was hypothesized that, after adjustment for area socio-demographic indicators, use of non-acute care hospital beds would be lower in areas where there are higher levels of provision of community services that have relatively intensive contact with patients. This was not confirmed: the non-acute hospital bed occupancy rate was significantly higher in areas with a larger percentage of mobile continuing care service users, and a larger percentage of the local population living alone or in overcrowded conditions. This

Table 6. Summary of Predictors of Service Utilization Rates (per 100,000 local area population)

Response	Predictors	Estimate	s.e.	t	df	p-value
Residential Services						
Hospital beds (acute)	Percent living alone	1.16	0.311	3.74	15	0.002
	Percent high-intensity continuing care users	-0.21	0.092	-2.24		0.041
Hospital beds (non-acute)	Percent living alone	3.29	0.965	3.41	14	0.004
	Percent overcrowding	1.49	0.495	3.02		0.009
	Percent mobile continuing care users	0.65	0.264	2.45		0.028
Non-hospital residential beds (non-acute)	No significant predictors					
Community Services						
Day services users (non-acute)	Availability of day services	12.10	3.444	3.51	15	0.003
	Percent overcrowding *	1.40	1.057	1.33		0.200
Emergency contacts	No significant predictors					
Continuing care users	Percent living alone	46.25	17.097	2.71	15	0.016
	Male unemployment rate *	38.50	19.644	1.96		0.069

* Confounder

model explains 54% of the variation in non-acute hospital bed use ($R^2 = 0.537$).

Non-Hospital Residential Beds (Non-Acute Care)

None of the socio-demographic deprivation indicators were significant predictors of occupancy rates.

Community Services

Day Services Users (Non-Acute Care)

The use of day and structured activities was directly related to the quantity of these services provided per 100,000 of local population. After adjusting for the percentage of the local population living in overcrowded conditions, this model explains 55% of the variation in the number of users ($R^2 = 0.549$). The percentage of overcrowding was retained in the model as a confounder.

Emergency Contacts

We hypothesized that after adjusting for socio-demographic deprivation indicators, higher levels of emergency contacts may reflect lower intensity day services use, lower levels of regular outreach to patients' homes (mobile continuing care), and lower non-hospital residential bed use. No significant predictors of emergency services use were found.

Continuing Care Users

A significant positive relationship was found between the rate of continuing care service users and the percentage of the local population living alone. After adjusting for the male unemployment rate, which was retained in the model due to confounding, 48% of the variation across the region is explained ($R^2 = 0.480$).

Discussion

The EPCAT standardized instruments were used to describe area socio-demographic characteristics, and measure service provision and utilization. We identified predictors of both inpatient and community service utilization using multiple regression models, which explained between 48 and 55 percent of variation in service use across the region. The predictive ability of the models was not validated as the study was cross-sectional; no new data were available for this purpose. However, the final models were chosen using a criterion such that they are optimal, as compared to all other models assessed, for the purpose of prediction.

Residential Care

Since 1978, there has been a 65% reduction in the provision of beds of all types. The shift from hospital to non-hospital residential beds for non-acute care was confirmed in a national survey on residential facilities in Italy.⁴³ The ESMS-based service provision rates in this study are consistent with those calculated for Piedmont in the national survey.

Hospital bed occupancy rates in Piedmont are low when compared to levels found elsewhere: Becker *et al.*⁴⁴ used the ESMS to describe mental health services for people with schizophrenia, and reported hospital bed use of 51 per 100,000 in suburban London, 117 per 100,000 in Amsterdam, and 261 per 100,000 in Copenhagen. The highest rate in Piedmont was 48.0 beds per 100,000 in the metropolitan catchment area of Torino Centro. Despite considerable regional variation in residential service use, the trend towards most residential care being provided outside hospital settings is evident, as would be expected under the community mental health care model. However, a better

understanding is required as to whether variations in service use are due to real differences in need for services, or whether they reflect differences in the process of developing the local community care network required to fully implement de-institutionalization policies.

The significant predictors of acute and non-acute hospital bed occupancy rates support the theory that community mental health care provision influences bed use. Acute hospital bed occupancy rates decreased with increasing rates of intensive continuing care users. Our finding that higher non-acute hospital bed occupancy rates are related to higher rates of mobile continuing care users may reflect local priorities in the use of community resources. Mobile and intensive continuing care services are preferentially offered to patients with psychosis in order to maintain them within the community, while a local practice has developed of offering treatment in a non-acute hospital setting more readily to patients with depression and other non-psychotic disorders requiring more intensive care. As a result, the extent to which these services are substitutable may be influenced by the impact of case-mix on available community resources.

Community Care

Several core characteristics of the community care network were effectively captured in the ESMS, by counting users involved in different day activities (acute and non-acute), by identifying users who receive interventions outside the community mental health centre (usually at home), and by differentiating users on the basis of the intensity of their contacts with the mental health staff.

Most of the continuing care teams were classified as providing mobile, high-intensity services; offering outreach interventions on a regular basis; and having the ability to provide intensive management of early critical or sub-acute phases of illnesses. Continuing care teams also provide most of the emergency services; the level of emergency contacts in a particular area depends to some extent on the team's flexibility to handle the demand for unplanned drop-in visits that are classified as emergencies. The significant positive relationship between provision and use of non-acute day services, suggests that day and structured activities are being fully utilized: as provision of these services increases, so does the number of patients referred to them.

Social Deprivation

The best socio-demographic predictor of mental health service use was the percentage of the local population living alone: it was a significant predictor of community continuing care service user rates, and both acute and non-acute hospital bed occupancy rates. The limited role of unemployment as a predictor of inpatient service use suggests a need for further research, as it has performed well as a predictor in other European countries.^{16,22,28} These relationships based on ecological characteristics do not necessarily apply to the individual. Our findings do not imply, for instance, that individuals with mental illness who

live alone are more likely to be admitted to hospital beds.

The importance of the percentage living alone, however, is consistent with evidence at the individual level on relationships between lower levels of social support and other health indicators. The most important are increased morbidity and mortality rates (particularly in cardiovascular disease and cancer), lower perceived health and well-being,⁴⁵ and higher use of health services.^{46,47} People with strong support networks adopt more healthy habits and use less primary care⁴⁸ as well as psychiatric services,^{49,50} as seen in the central role played by family members for most users of psychiatric services.⁵¹ Although it is true that living alone is not necessarily an indicator of social isolation, it is a common proxy indicator that is of particular relevance in the case of people with severe or long-term mental illness.

At the ecological level, Thornicroft *et al.*³⁵ found that in North-eastern Italy the percentage living alone was a predictor of admission activities in South-Verona (6 urban districts), but that social isolation was not correlated with service use in Portogruaro (11 rural districts). Since no consistent association between social deprivation and service use was found in Portogruaro, they concluded that models based on indices of social deprivation would not be effective in rural districts. By comparison, Glover *et al.*³¹ examined admission prevalence at the small area level within 16 catchment areas in an English health service region, and found that predictors varied between urban and rural areas. They suggested that broadly based composite indices, rather than one or two single variables, are required to predict need for mental health services. A Mental Illness Needs Index (MINI) containing six weighted variables, among them social isolation, poverty, and unemployment, accounted for 82% of the regional variation in admission prevalence at the catchment area level, performing substantially better than Jarman's UPA (53%) and Carr-Hill and colleagues' York index (70%). Our results are compatible: multiple regression models explained 53% of the variation in hospital bed use across the Piedmont region. Further cross-national research using a standardized methodology should consider the influence of the social network independently of other socio-economic indicators, to verify the relative importance of this in predicting service use in southern and in northern European countries.

Other ecological studies have shown that the relationship between inpatient activities and socio-economic deprivation varies by diagnosis group and by the measure of psychiatric service use considered.^{22,25,27,28} Differences in results have also been attributed to differences in the size of study areas.²⁸ Different statistical procedures, as well as the level of analysis, often suggest different sets of predictors as optimal. In this study, since the unit of analysis was necessarily the catchment area, the sample size was small even though data relate to large numbers of service users. Replication using smaller health areas would be of substantial interest.

Policy Evaluation and Resource Allocation

We have quantified relationships between residential and community mental health services use and area level

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indicators of social deprivation; and we have shown that use of inpatient and community services is likely to be related. If we accept service utilization as a proxy for need for services, it follows that when evaluating mental health policy and service systems, or when allocating resources to local health authorities, the level of both residential and community service use should be considered in relation to area deprivation.

Recent work in the UK on developing small area indices of deprivation that predict need for mental health services for the purpose of resource allocation has focused on inpatient admission rates and admission prevalence.^{21,31} Following their general approach, the methodology used in this study could be used to develop a resource allocation model that also takes into account community service use. A concurrent quantitative assessment of residential and community service use was feasible using the EPCAT instruments, but trained field researchers were required for reliable data collection.

Given the gap in mental health care expenditure between metropolitan authorities and other health authorities,⁵²⁻⁵⁴ such as the variation observed in Piedmont (**Figure 1**), the Piedmont regional health administration is interested in using evidence-based indicators of need for services to define budgets in a more equitable manner. Exploring the link between the current trend in expenditure and variations in service use is beyond the scope of this investigation, but represents a crucial step in developing a regional formula for allocating mental health resources.

With increasing emphasis on evidence-based mental health policies, quantitative relationships that link the distribution of mental health resources to need for services are of growing importance. Even in countries with well-organized health care systems that include a community mental health care network, the risk of inequities such as inadequate access to effective treatment and social exclusion, particularly for people with severe mental illness, continues.⁵⁵ Effective management of this risk relies on empirical evidence made available through independent research activities that would enable policy-makers to ensure horizontal equity in access, and mental health professionals and leaders to meet the need for vertical equity through the quality and range of available services.^{56,57}

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