The Geographical Distribution of Mental Disorder in Denmark 1971-1990: A Study of First Admission Rates

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Abstract

In the period 1971-90 the first admission rate to Danish psychiatric hospitals and wards decreased by approximately 45%. This might reflect the similar decrease in number of available psychiatric beds. Generally, the decrease of first admission rates was larger in the metropolitan area than in the rest of the country. Consequently, the disparity in admission rates between town and country was reduced. Number of available beds has gained increasing importance as a predictor of variations between counties and municipalities whereas the importance of distance to hospital and degree of urbanization has declined. As regards socio-demographic variables special importance should be attached to variables for social aid and the employment rate in the social and health sector. However, it is generally difficult to determine whether regional variations are due to differences in treatment facilities or morbidity differences. From a disaggregate analysis it will appear that the diagnoses schizophrenia and alcoholism are especially related to low status areas whereas a connection with social status regarding neuroses and manic-depressive psychoses is less obvious.

Keywords

Psychiatry, first admissions, socio-demographic variables, bed-capacity, multivariate analyses.

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This paper examines the regional variations of first admission rates of psychiatric patients. Up until 1976 psychiatry was organized by the Danish state with treatment at the psychiatric hospitals of that time. In 1976 psychiatry became a county matter, however, in the early 1990s, a further decentralization has taken place with parts of both the financial and organizational responsibility being transferred to the municipalities. The increasing interest during recent years in analyses of the regional variations of psychiatric morbidity should be perceived on the basis of this decentralization (Andersen 1987).

In Denmark, studies of regional variations have mostly been carried out within the somatic area with special focus on regional variations in medical treatment during the 1980s (Andersen & Loft, 1987) and in this connection of the nature of different treatment facilities. The use of such facilities is probably related in part to their availability and proximity. Already in the middle of the last century Jarvis (1850) demonstrated that persons living near psychiatric hospitals were the ones most frequently admitted. This effect should be avoided by using data on first admissions as in this study. Another approach of regionalization is in the identification of specific socio-demographic indicators that co-vary spatially with incidence rates of morbidity, the so-called ecological approach (Smith, 1976). The characteristics of first admissions are expected to be more in accordance with the population they represent than is the case for the total number of admissions which also includes patients with repeated contacts with the psychiatric hospital service.

The overall aim is to study the extent to which regional variations of first admissions can be attributed to regional variations of morbidity (demand) or whether such differences reflect regional differences of treatment facilities (supply).

Geographical variations of first admissions will be described in relation to town size and illustrated by a number of variables for socio-demographic conditions in the municipalities. Furthermore, it is assumed that first admissions are related to the availability of treatment facilities and the existing hospital bed capacity.

In general, the pattern is described for all diagnoses. At the end of the article a disagreggate analysis is made with a detailed analysis in connection with the pattern of selected diagnosis groups.

Materials and Methods

The object of the study is all first adult admissions to psychiatric wards and hospitals as well as neurosis clinics and alcohol clinics in the period 1971-1990, inclusive. As dependent variable the directly standardized rate of incidence is calculated for men and women together, with the age structure in 1971 for the total Danish population as standard. The incidence, ie the number of new cases appearing during a certain observation time, eg a year, is related to the population figures in municipalities and expressed in terms of per thousand. The aim of the standardization is to make the rates independent of possible differences in age structure between the municipalities. The admission data derive from Det psykiatriske centralregister (The Danish Psychiatric Case Register) (Munk-Jørgensen et al, 1993). The rate is calculated as an annual average of the cumulative rate of incidence for each of the following five year periods: 1971-1975, 1976-1980, 1981-1985 and 1986-1990.

These calculations have been made for:

1. *275 municipalities in Denmark including Copenhagen and Frederiksberg*
2. *12 urbanization groups (Danmarks Statistik, 1988)*

In connection with the municipality specific analysis, linear regression analysis is used for the estimation of variations of the dependent variable: the logarithm 10-rate as a function of the independent variables. The independent variables can be classified as follows:

1. *Variables for treatment facilities: hospital bed capacity, location of psychiatric ward as well as degree of urbanization*
2. *Socio-demographic variables for demand relations: a total of 34 different variables are included in the background report for demographic, socio-economic and social conditions (Madsen, 1997).*

The contents and extent of these categories of variables cover what literature refers to as adequate and relevant for an ecological approach in connection with studies of regional variations of mental disorder (Burgess et al., 1992). In connection with a cluster analysis of municipalities, a principal component analysis has been used to reduce the 34 variables to 5 underlying dimensions.

On the basis of various selection methods in connection with a factor analysis of the studied variables and a stepwise regression analysis only two significant socio-demographic variables have been included in the final model as well as the measure of hospital bed capacity in order to account for the regional variations.

The relations between the independent variables and first admissions are determined on the basis of aggregated data information for the individual municipality and are made in principle as a cross sectional analysis. As the degree of accuracy on which the admission rate is determined for the individual municipality especially depends on the municipality size, a weighting procedure is used based on the reciprocal variance of the rate estimates (Podcock et al., 1981).

All Diagnoses

In the period 1971-1990 there was a total of 193,767 first admission patients (Table 1).

The decrease in rate of first admissions from 3.04 to 1.63 nearly corresponds with the decrease in number of beds per

Table 1: The development of first admissions as well as measures for directly standardized admission rate and hospital bed capacity 1971-1990 for the whole of Denmark

	1971-75	*1976-80*	*1981-85*	*1986-90*
Number of first admissions	59,077	54,120	45,315	35,255
Dir. std. rate per 1,000 inhabitants >14 year annually:				
Men	2.87	2.58	2.15	1.65
Women	3.22	2.79	2.15	1.60
Total	3.04	2.68	2.15	1.63
Number of beds per 1,000 inhabitants at the end of the period	1.89	1.67	1.32	1.01

thousand inhabitants of 46.6 per cent. A larger drop of the admission rate for women than for men may be due to the fact that a number of disorders with the highest admission frequency for women, like neuroses, has been decreasing during the period in question (Madsen, 1997).

The Development Classified according to Urbanization Groups

The decrease of the directly standardized rate on a national basis will appear from similar calculations for urbanization groups. This is investigated by means of the comparative ratio, relating the directly standardized rate for each urbanization group to the rate for the whole of Denmark from Table 1 for each period. A value higher than 1.0 indicates for each period a level above the average for the whole country and vice versa for values below 1.0.

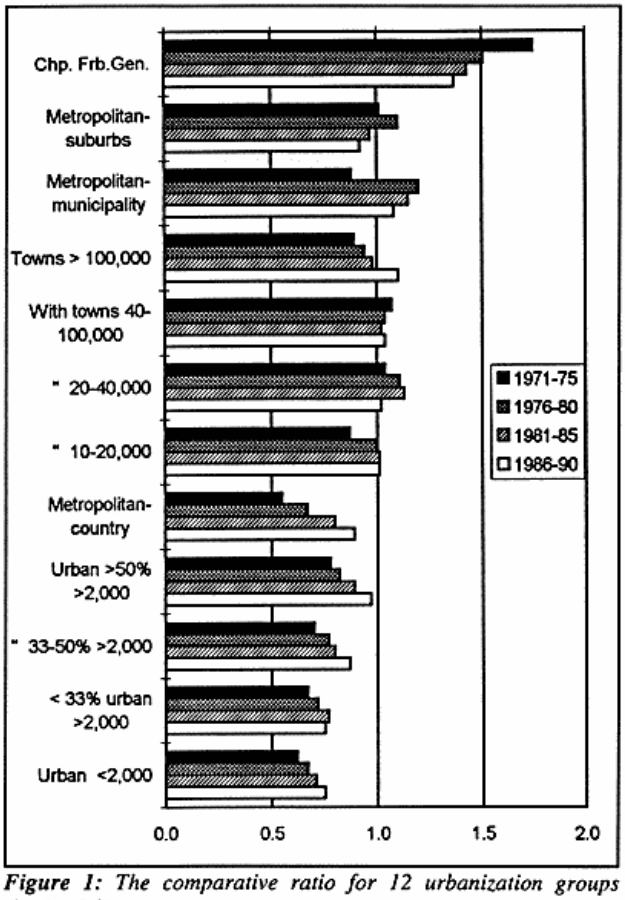

Figure 1: The comparative ratio for 12 urbanization groups (basis=1.0).

Figure 1 shows the comparative ratios for 12 urbanization groups, grading municipalities according to their degree of urbanization.

It appears that the rate - compared to the country average - is related to the degree of urbanization: the more people who live in built-up areas the higher the rate. During the whole period the three municipalities of Copenhagen, Frederiksberg and Gentofte have had the highest admission rate however, with decreasing values. Rural district municipalities, ie municipalities where the largest town counts less than 2,000 inhabitants, have had the lowest value through the whole period. However, there has been a tendency of relatively increasing values of the studied ratio in the least urbanized areas from 1971 to 1991. This shows a clear convergence regarding a more even distribution: a decline for metropolis areas and an increase for other groups.

Municipality Specific Analyses

The directly standardized rate for the country as a whole, ie the nation-wide average, has been calculated at 1.63 first admissions per 1,000 inhabitants over 14 years, cf. Table 1, whereas the municipality average is 1.34, regardless of municipality size, cf. Figure 2.

Distributed on the individual municipalities, this briefly illustrates the distribution of first admissions in the period 1986-1990. In general, the rates seem to concentrate with high values for municipalities in the counties of West Sealand as well as in definite peripheral areas like Bornholm and the northern part of Viborg county in Jutland. Municipalities with a psychiatric hospital or ward also seem to be represented with relatively high rates in these areas. This applies ia to the municipalities of Copenhagen, Frederiksberg, Hillerød, Holbæk, Dianalund, Svendborg, Ribe and Thisted.

Correlation and Regression Analysis

The connection between admission rates for municipalities and various explanatory variables is illustrated by means of a linear regression analysis for the period 1986-1990. The choice of independent variables depends on a principal component analysis in connection with studies of the intercorrelation of the variables, ie test for multicollinarity

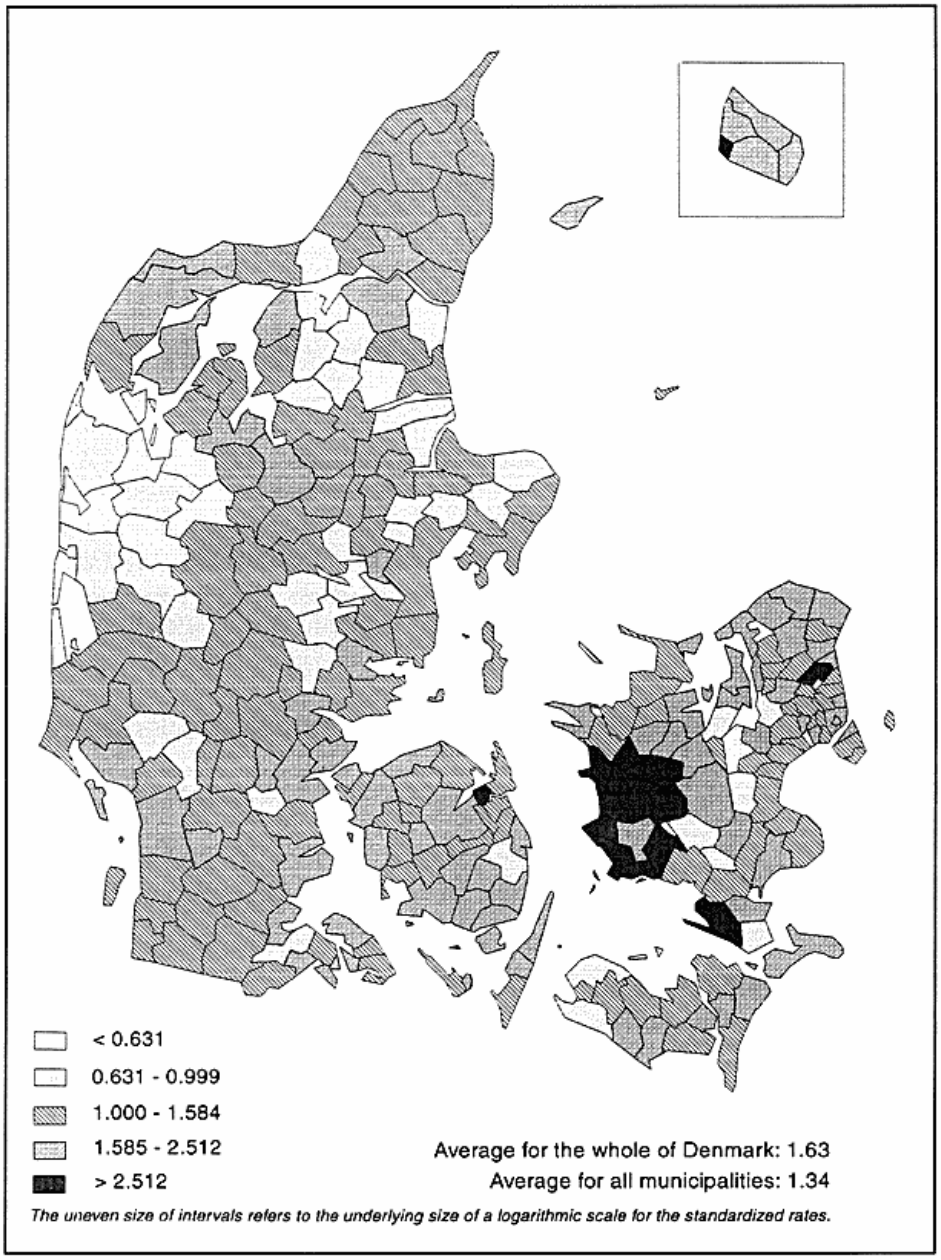

Figure 2: *First admissions 1986-90. Average of directly standardized rate in municipalities per 1,000 inhabitants > 14 years.*

(Belsley et al., 1980). Furthermore, the simple correlation of certain variables with the dependent variable has also been studied to reach a meaningful interpretation of the included variables.

Of the studied demand variables the connection with the first admission rates is highest for "social security benefits" in municipalities which corresponds with a similar analysis carried out by Juel & Schousboe (1992). On the basis of the above-mentioned analyses of the explanatory variables which comprise both socio-demographic variables and the mentioned structural variables for supply conditions, a multiple regression model has been used in connection with the logarithm rate of first admissions, cf. Table 2. This indicates the regression coefficients, and for each step in the stepwise analysis it also indicates the percentage described by the model of the total variation between municipalities.

With the inclusion of only three explanatory variables it has been possible to describe more than 40 per cent of the total variation of first admissions between municipalities. The significant variables should not be assigned too much predictive value. In this connection they merely illustrate examples of a certain connection with the dependent variable and not any causal relations. For the variable "share of employees in the social and health sector" it could be presumed that this would be influenced by the existence of psychiatric treatment centres in the municipality, which is why the employment in this sector could be perceived as a variable for proximity to psychiatric institutions.

Table 2: Multiple regression analysis of logarithm rate $_{86\text{-}90}$ with demand variables (D) and structural variables (S) for the period 1986-1990.

		Values after last steps		
Step	*Explanatory variables*	*b-value*	*t-value*	*R^2 after each step*
1.	Social security benefit (D)	0.0076	8.42	.307
2.	Social-/health (D)	0.0151	4.68	.363
3.	Bed capacity (S)	0.0102	4.28	.401
	Constant	-0.3886	-4.68	

t-value = 4.28 is significant at the 0.0001 level

Dependent variable:

Logarithm rate $_{86\text{-}90}$: Annual directly standardized admission rate per 1,000 inhabitants over 14 years (logarithm 10-transf.)

Explanatory variables:

1. *Total social security benefits per 15-44 year old in the municipality (transf.: square root of variable)*
2. *Percentage share of employees in the social and health sector, 1986.*
3. *Bed capacity: Number of beds per 10,000 inhabitants in the county in question, 1989*

The Development 1971-1990

Below a similar regression analysis is made with structural variables, also for the three preceding periods (Table 3). A rather uniform pattern appears both as regards the sign characters, size and changes over time of the independent variables. The variable "bed capacity" appears to be of increasing importance as a predictor for the admission rate.

At the same time it appears that location of treatment facilities in the municipalities is of decreasing importance. This is also the case for degree of urbanization which, for the first three periods, has the greatest explanatory value. This confirms the development according to Figure 1 as regards the classification into 12 urbanization groups. It should be added that the variable for urbanization in this connection should be regarded as an "umbrella variable" for a number of socio-demographic relations for which

Table 3: Multiple regression analyses of logarithm rates for periods with structural variables.

	Regression coefficients and t-values (in parenthesis)				
Period	*Constant*	*Urbanization*	*Bed capacity$_p$*	*Psych.ward$_p$*	*R^2*
1971-75	-0.0824	0.0044	0.0042	0.1151	.437
	(-2.17)	(9.47)	(7.19)	(5.17)	
1976-80	-0.1104	0.0039	0.0074	0.1121	.381
	(-2.61)	(7.78)	(7.22)	(4.58)	
1981-85	-0.1552	0.0033	0.0112	0.1015	.280
	(-3.27)	(5.82)	(5.87)	(3.62)	
1986-90	-0.1834	0.0019	0.0166	0.0986	.241
	(-4.03)	(3.55)	(6.42)	(3.73)	

t-value =5.0: significant at the 0.0001 level; t-value = 3.5: significant at the 0.004 level

Explanatory or independent variables:

Urbanization: *Percentage share of the population in built-up areas with more than 200 inhabitants in municipalities, 1986.*

Bed capacity$_p$: *Number of beds per 10,000 inhabitants in the county in question, at the end of the period p.*

Psychiatric ward$_p$: *Location of psychiatric ward in terms of a dummy variable = 1 for presence, 0 for other municipalities, at the end of the period p.*

variable information has been collected only for the period 1986-1990.

Diagnosis Specific Analysis

The above analysis uses the rate for all first admissions as a dependent variable for geographical variations of the admission pattern which, of course, covers considerable variations of this measure because of the different diagnoses involved in the material. An ICD-8 breakdown constitutes 15 main diagnosis groups (Sundhedsstyrelsen, 1991).

As such a disaggregation will increase the uncertainty for the diagnosis specific rates the 275 municipalities have been combined by means of a cluster analysis to constitute 15 municipality clusters. This has been based on the 34 socio-demographic variables for municipalities. A principal component analysis has been used to reduce the variation in the data to 5 underlying dimensions, cf. Table 4. This shows that 77.2 per cent of the total variance for the 34 socio-demographic variables can be reduced to 5 underlying dimensions with the content which has been named according to the most important variables correlated with the component in question. This is illustrated in Table 4 showing a variable with the highest loading (correlation). A similar method has been used in connection with an analysis of psychiatric admissions in the city of Nottingham, England (Giggs, 1986).

The cluster analysis is performed as a so-called "quick cluster analysis" (Norusis, 1990). The clusters vary in size from representing 1 municipality to comprising 60 municipalities which, of course, gives rise to some methodological problems regarding variance and homogeneity, etc. Subsequently an attempt has been made to name the individual clusters in relation to a characteristic "representative", ie a municipality located "near" the gravity centre of the cluster in question, ie the average component score which is calculated for each of the 5 components by the analysis.

On the next page, Table 5 characterises the 15 clusters on the basis of the component analysis. The clusters are grouped into four sectors and are further ranged according to urban density. The highest density is found in Frederiksberg, the municipality in the centre of Greater Copenhagen. At the other end of the scale "Møn" is characterized as the most rural cluster.

At the same time the table reflects the comparative ratio for standardized rates for 4 selected diagnosis groups and all diagnoses for each cluster. A value higher than 1.0 also in this case indicates a level above the average for the whole country.

It appears that schizophrenia and alcoholism are especially represented in metropolitan areas whereas manic-depressive, ie affective psychoses to a higher extent are found in provincial towns and rural areas. See Figure 3 for the two selected diagnoses. The distribution of neuroses seems to be more incidental. The strength of the similarity between the geographical distribution of the 5

Table 4: Principal component analysis of 34 socio-demographic variables with indication of explained variance and the most important variable according to a varimax rotation.

Component	*Explained variance*	*Most important variable*	*Loading*
Comp. 1: Social status	36.3%	"Share with short as well as further education"	+0.87
Comp. 2: Occupational and income status	22.9%	"Share with gross income under DKK 50,000"	+0.81
Comp. 3: Big city/ single	8.8%	"Share in block of flats"	+0.76
Comp. 4: Housing and age structure	5.5%	"Share of buildings erected in the period 1975-86"	+0.78
Comp. 5: Social come-down	3.8%	"Permanent social security for more than 9 months"	+0.82
Total variance	77.2%		

Table 5: Comparative ratio of standardized rate for diagnoses seen in relation to homogeneous socio-ecological areas (clusters).

Number of municip.: *The clusters:*	*Characteristics:*	*Schizophrenia*	*Manic-depressive*	*Neuroses*	*Alcohol abuse*	*All diagnoses*
Metropolitan areas:						
1 Frederiksberg	high status, single	1.06	1.59	0.76	1.19	1.41
1 Copenhagen	single, social come-down	2.37	1.18	0.97	1.69	0.83
4 "Rødovre"	engaged in active employment, single	0.49	0.54	0.95	0.84	0.83
3 "Gentofte"	high status, engaged in active employment	0.46	0.63	1.00	0.84	0.89
7 "Ballerup"	engaged in active employment, social come-down	0.86	0.38	0.87	1.04	0.95
3 "Aarhus"	high status, single	1.60	1.22	0.97	1.19	1.10
Suburban areas:						
5 "Værløse"	high status, engaged in active employment	0.43	0.61	0.93	0.91	1.11
23 "Farum"	high status, engaged in active employment	0.89	0.70	1.00	0.79	0.87
21 "Jægerspris"	housing development	0.77	1.10	0.89	0.92	0.90
Provincial towns:						
33 "Randers"	single	0.83	1.03	1.27	1.10	1.12
60 "Kerteminde"	social benefit	0.69	1.03	1.04	0.87	0.86
51 "Gørlev"	housing development, social come-down	0.77	1.09	0.91	0.84	0.87
Rural areas and periphery:						
30 "Grindsted"	low status, single	0.51	0.87	0.80	0.55	0.71
22 "Helle"	low status, social come-down	0.46	1.21	0.73	0.50	0.74
11 "Møn"	only few engaged in active employment, social come-down	0.83	1.04	1.00	0.81	0.92
The whole country		1.00	1.00	1.00	1.00	1.00

Comparative ratio: *The directly standardized rate for each cluster divided by the rate for the whole of Denmark.*

Table 6: Product moment correlation for 4 diagnosis groups and all diagnoses.

	Schizophrenia	*Manic-depressive*	*Neuroses*	*Alcohol abuse*	*All diagnoses*
Schizophrenia	1.0				
Manic-depressive	0.42	1.0			
Neuroses	0.57	0.21	1.0		
Alcoholism	0.87	0.28	0.23	1.0	
All diagnoses	0.71	0.43	0.04	0.89	1.0

categories is tested by means of the Pearson product moment correlation analysis, cf. Table 6.

All the intercorrelation produces positive values which indicate a certain accordance in the spatial incidence pattern, however, for values below 0.6 the connection is not significant at the 0.01 level which is why there is only a certain accordance between the pattern for schizophrenia and alcoholism.

This tendency can also be proved for the 3 previous periods and thus it supports a rather uniform incidence pattern for those mental disorders (Madsen, 1997).

Multiple Regression Analysis

By means of a multiple regression analysis it is examined whether variations between clusters for directly standardized logarithm rates of first admissions can be described by characteristics for these clusters. As independent variables for this purpose the component scores are used for the 5 components which appeared indirectly from the cluster analysis and Table 5.

Table 7 gives the result of such an analysis for all diagnoses compared with first admissions for the diagnosis alcoholism. Furthermore, the table reflects the components included in the multiple linear model with indication of explained variance after each step. A similar method has been used previously by Giggs (1986).

The components show a direct connection with the logarithm rate. As regards the contents of these components, please see Table 4.

It appears that 63.4% of the variation of all first admissions for these clusters can be explained statistically by the defined components. The relatively high degree of explanation seen in relation to Table 2 is due to the high aggregation level for analysis units which blurs much of both the random and the non-random variation between municipalities.

The equivalent regression analysis for the diagnosis category alcoholism gives a statistically better explanation of geographical variations (almost 90%) and includes more explanatory components. This is, of course, due to the fact that all diagnoses form an inhomogeneous group in which possible connections with underlying socio-demographic

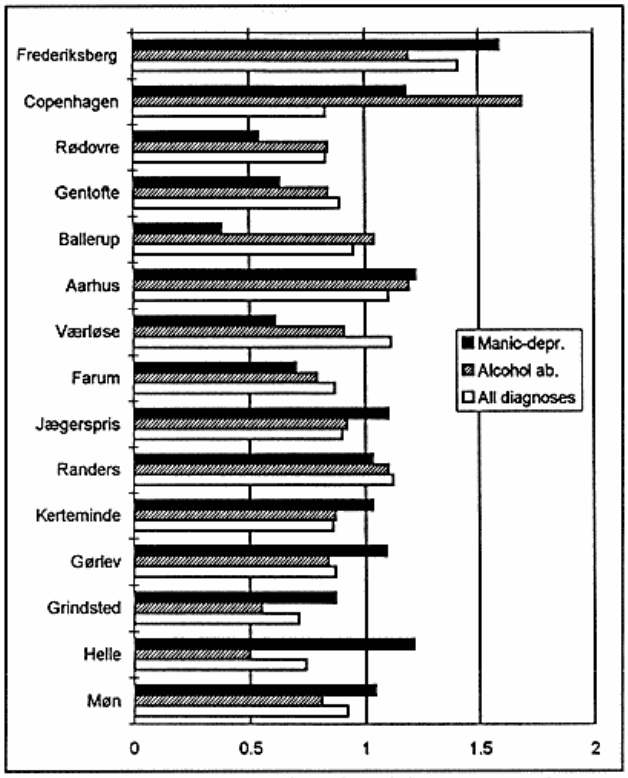

Figure 3: Comparative ratio for selected diagnoses in relation to clusters (basis = 1.0).

Diagnosis category	*Step*	*Component*		*R^2 after each step*
All diagnoses	1	Comp. 1	Social status	.261
	2	Comp. 5	Social come-down	.634
Alcohol abuse	1	Comp. 5	Social come-down	.420
	2	Comp. 1	Social status	.714
	3	Comp. 2	Occupational & income conditions	.852
	4	Comp. 3	Single and big city conditions	.897

Table 7: Summary results of multiple regression analyses of logarithm rates and component score (demand variables) for the period 1986-90.

variables cannot always be assigned the same value. Thus it often occurs that a diagnosis like manic-depressive psychoses is relatively strongly represented in high status areas while the reverse is the case for the diagnosis of schizophrenia (Giggs, 1986), cf. also Table 5.

Figure 4 illustrates how well the regression model fits the data. The deviations from the expected value (horizontal line = 1.0) are, of course, biggest for all diagnoses where the statistical explanation ability was smaller than for alcoholism. For all diagnoses it appears that the model underestimates the municipalities of Copenhagen and Frederiksberg and overestimates the values for other clusters in the metropolitan area. To some extent the opposite is the case for alcoholism.

As will appear from Tables 5 and 6 the diagnoses of schizophrenia and alcoholism show a somewhat similar distribution pattern. Even though it is impossible to say anything about the causal relations, there is no doubt that in areas with considerable social problems and social comedowns, ie component 5 which has a close connection with "permanent social security", there are more cases of alcoholism than in affluent areas. According to Table 7 there is a tendency towards many first admitted alcoholics in affluent areas. This may be due to methodological relations in connection with so-called ecological fallacy (Rosen et al., 1985) as alcohol problems more generally occur in big city areas than in the country, cf. inclusion of component 3 (single and big city conditions) in step 4. At the same time, social status is generally higher in urban areas compared to rural districts which may result in the above-mentioned "fallacy".

Conclusion

The analysis in terms of time of the development in psychiatric admissions shows that a significant drop in the admission rate can be attributed especially to a corresponding drop in number of beds, ie a confirmation of "Roemer's principle" to the effect that the number of beds offered creates its own demand (Roemer, 1991).

The importance of bed capacity has increased for regional variations of first admissions which has thus become a limiting resource that can be attributed to political decisions to reduce the bed capacity at psychiatric hospitals.

Concurrently with the decrease in number of beds available it appears that differences between town and country have been effaced. This regional equalization could be due to the fact that there is a more widespread acceptance of mental disorders in all classes of the community or that the balance of social or psychic problems over time has shifted

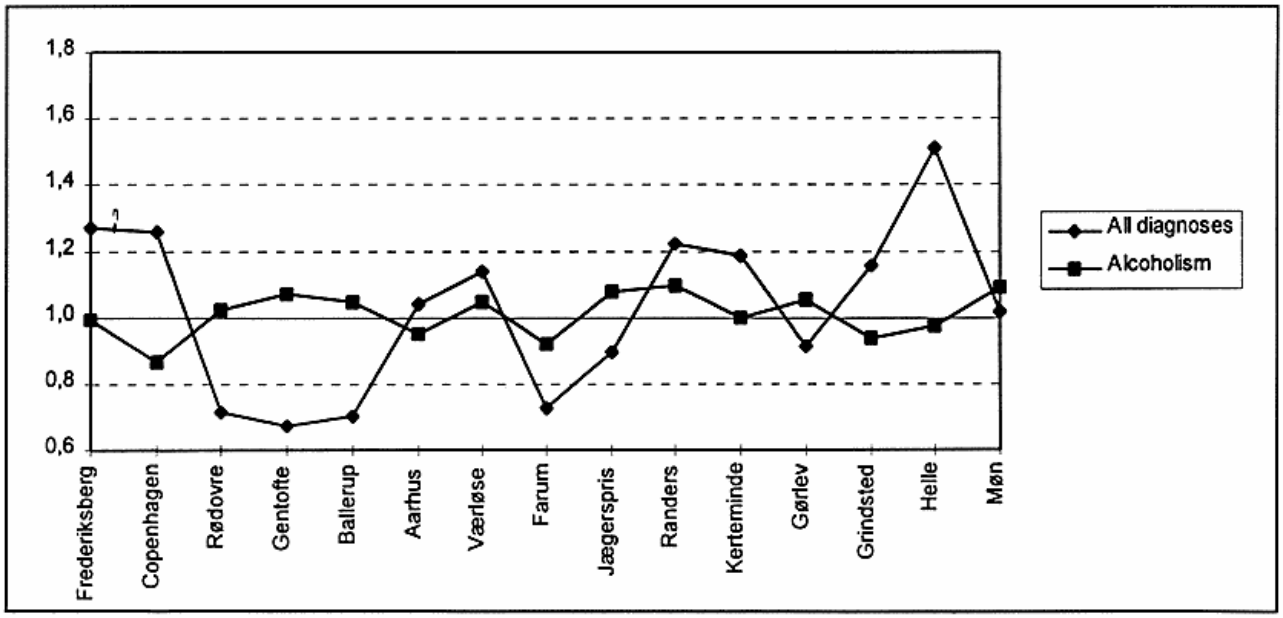

Figure 4: Ratio for the observed and expected directly standardized rate in clusters 1986-90 (basis= 1.0).

to exist also in rural areas. There may be several reasons for this development, however, part of the explanation could be the rural exodus in connection with the change from an agricultural society to a modern industrial society with a more marked labour division than before.

In the beginning of the 1970s the regional variations could possibly be attributed to conditions related to the centrally organized state hospitals of that time. In those days distance from the hospital played a more significant role than today with the increased mobility and decentralization of the psychiatric treatment (Sundhedsstyrelsen, 1991). In general, geography today (here expressed in terms of variables for urbanization and access to psychiatric treatment) seems to be of less importance than before. However, in municipalities with a psychiatric institution, the admission rate is larger than expected.

Measures for possible variations of psychiatric morbidity seem to explain the major part of the geographical variation more than differences in the existence of treatment facilities, cf. Table 2 which, for the period 1986-1990, shows that 36.3 per cent of the total variation between municipalities is due to socio-demographic conditions whereas this share lies at a considerably lower level for the structural variables in the same period, cf. Table 3. Of all studied variables for the period 1986-1990, the closest connection with the rate in municipalities for first admissions exists for "paid social security benefits". This variable, however, should be considered as a variable for a number of social and economic conditions in municipalities; however, no information has been obtained about these conditions.

The connection with socio-demographic variables has only been studied for the period 1986-1990 where these show a relatively weak connection with all diagnoses. This connection is considerably strengthened with a disaggregation into diagnosis groups, however, with an aggregation to municipality clusters. This part of the analysis shows that the established clusters are well suited for studies of social events, especially if they can be related to conditions linked with the defined components, like in this case first admissions among the mentally disordered. It should be noticed that the principal component analysis has been carried out independently of the admission pattern. Furthermore, the clusters used and their characteristics could be used in connection with a description of other social events, like crime, suicide and drug abuse.

In general, the analysis has shown significant variations in the geographical distribution of mental disorders, however, a complete appreciation of these variations requires a knowledge of both supply and demand variables. A number of indicators have been used in this analysis for such conditions which have proved to be associated with the selected diagnosis groups. Thus, efforts must be made for a diagnosis specific approach. The ideal approach would be to link background information directly related to the patients admitted; however, the present aggregate analysis could contribute to put forward hypotheses regarding possible connections between socio-ecological variables and psychiatric admissions with a view to more detailed analyses at the individual level.

The method can also be used to analyse all admissions to estimate the total consumption of resources used in connection with psychiatric treatment. In this connection it is necessary when interpreting the geographical distribution to consider the so-called drifting tendencies because psychiatric patients tend to move over time to certain areas. This happens for voluntary or compulsory reasons, however, to various degrees according to the mental disorder in question following selective mechanisms in connection with migration (Giggs, 1984). With the ongoing decentralization of the district psychiatry it will be the task for Danish municipalities in the future to assess the need for psychiatric treatment, in cooperation with the counties. Consequently, a current evaluation and distribution scale is to be desired in order to plan the professional efforts in the treatment of the mentally afflicted, perhaps on the basis of some of the methods described in this paper.

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to exist also in rural areas. There may be several reasons for this development, however, part of the explanation could be the rural exodus in connection with the change from an agricultural society to a modern industrial society with a more marked labour division than before.

In the beginning of the 1970s the regional variations could possibly be attributed to conditions related to the centrally organized state hospitals of that time. In those days distance from the hospital played a more significant role than today with the increased mobility and decentralization of the psychiatric treatment (Sundhedsstyrelsen, 1991). In general, geography today (here expressed in terms of variables for urbanization and access to psychiatric treatment) seems to be of less importance than before. However, in municipalities with a psychiatric institution, the admission rate is larger than expected.

Measures for possible variations of psychiatric morbidity seem to explain the major part of the geographical variation more than differences in the existence of treatment facilities, cf. Table 2 which, for the period 1986-1990, shows that 36.3 per cent of the total variation between municipalities is due to socio-demographic conditions whereas this share lies at a considerably lower level for the structural variables in the same period, cf. Table 3. Of all studied variables for the period 1986-1990, the closest connection with the rate in municipalities for first admissions exists for "paid social security benefits". This variable, however, should be considered as a variable for a number of social and economic conditions in municipalities; however, no information has been obtained about these conditions.

The connection with socio-demographic variables has only been studied for the period 1986-1990 where these show a relatively weak connection with all diagnoses. This connection is considerably strengthened with a disaggregation into diagnosis groups, however, with an aggregation to municipality clusters. This part of the analysis shows that the established clusters are well suited for studies of social events, especially if they can be related to conditions linked with the defined components, like in this case first admissions among the mentally disordered. It should be noticed that the principal component analysis has been carried out independently of the admission pattern. Furthermore, the clusters used and their characteristics could be used in connection with a description of other social events, like crime, suicide and drug abuse.

In general, the analysis has shown significant variations in the geographical distribution of mental disorders, however, a complete appreciation of these variations requires a knowledge of both supply and demand variables. A number of indicators have been used in this analysis for such conditions which have proved to be associated with the selected diagnosis groups. Thus, efforts must be made for a diagnosis specific approach. The ideal approach would be to link background information directly related to the patients admitted; however, the present aggregate analysis could contribute to put forward hypotheses regarding possible connections between socio-ecological variables and psychiatric admissions with a view to more detailed analyses at the individual level.

The method can also be used to analyse all admissions to estimate the total consumption of resources used in connection with psychiatric treatment. In this connection it is necessary when interpreting the geographical distribution to consider the so-called drifting tendencies because psychiatric patients tend to move over time to certain areas. This happens for voluntary or compulsory reasons, however, to various degrees according to the mental disorder in question following selective mechanisms in connection with migration (Giggs, 1984). With the ongoing decentralization of the district psychiatry it will be the task for Danish municipalities in the future to assess the need for psychiatric treatment, in cooperation with the counties. Consequently, a current evaluation and distribution scale is to be desired in order to plan the professional efforts in the treatment of the mentally afflicted, perhaps on the basis of some of the methods described in this paper.

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