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## Some Influences on the Intercounty Variation in Irish Psychiatric Hospitalization Rates

By DERMOT WALSH and BRENDAN WALSH

An earlier commentary on the level and regional variation of Irish hospitalized psychiatric illness was limited by the absence of age-specific and standardized data (Walsh and Walsh, 1968). The present paper presents age- and sex-standardized rates by county for 1959, and then suggests some socioeconomic influences in [partial explanation of the variation in these rates. Psychiatric services in Ireland are provided on a county basis: in eleven instances one hospital serves a single county, in six cases there is one hospital to two counties and the remaining hospital serves three counties.

The rate of hospitalization for psychiatric illness in Ireland is available by age group for 1960, and is presented in Table I. Hospitalization increases with age up to age 70 and then declines. Counties with higher than average percentages of their population in the late

TABLE I  
*Age-Specific Hospitalization Rates, Ireland—1960*

Age Group	Rates per 1,000 Population
15-24	2.01
25-34	7.67
35-44	10.18
45-54	12.31
55-64	14.92
65-69	16.32
70-79	14.78
80+	13.02

middle-age groups would tend to have high hospitalization rates as a simple consequence of this population age-structure.

Table II presents the rates of hospitalization by sex for each hospital area. There is a tendency for males to have higher rates of hospitalization than females. Thus, areas with higher than

TABLE II  
*Hospitalization Rates per 1,000 Population aged over 15 by Area and Sex (1959)*

Hospital area	Counties	Male	Female
Ardee	Louth	10.5	6.6
Ballinasloe	Galway, Roscommon	16.7	13.6
Carlow	Carlow, Kildare	6.7	7.4
Castlebar	Mayo	13.3	12.7
Clonmel	Tipperary	14.4	7.8
Cork	Cork	11.1	9.2
Ennis	Clare	13.6	11.5
Enniscorthy	Wexford	8.4	8.3
Dublin	Dublin, Wicklow	7.3	6.4
Kilkenny	Kilkenny	11.8	7.5
Killarney	Kerry	13.7	12.6
Letterkenny	Donegal	10.7	7.5
Limerick	Limerick	8.8	9.9
Monaghan	Monaghan, Cavan	10.9	12.1
Mullingar	Meath, Westmeath, Longford	10.4	10.8
Portlaoise	Leix, Offaly	10.2	10.2
Sligo	Sligo, Leitrim	17.1	14.3
Waterford	Waterford	10.5	11.4

TABLE III

*Population Age Structure, Ireland and England and Wales 1961 and Standardized Hospitalization Rate for Ireland*

Age Group	% of Population Aged 15+ in each group	
	Ireland %	England and Wales %
15-24 .. ..	20·19	17·12
25-34 .. ..	15·36	16·42
35-44 .. ..	17·37	17·68
45-54 .. ..	17·09	18·16
55-64 .. ..	13·77	15·17
65-69 .. ..	5·33	5·57
70-79 .. ..	8·04	7·35
80+ .. ..	2·86	2·55
Total .. ..	100·0	100·0

Source: UN Demographic Yearbook 1963.

Crude Hospitalization Rate per 1,000 aged 15+ 9·94

Standardization Rate per 1,000 Aged 15+ 10·23

(U.K. Age Structure as Standard)

average percentages of males in their populations would tend to have high hospitalization rates. In looking at the crude rate for Ireland and for each county it is impossible to say to what extent the high rate recorded for Ireland and the great variation in the rates between counties are attributable to the peculiarities of Ireland's population age and sex structure.

Ireland's long history of net out-migration and population decrease have given the country an unusual demographic configuration. Migration has tended to be heaviest among those in young adulthood and to be slightly greater among women than men. Since migration has also been much heavier in some counties than others, the counties with the heaviest out-migration and population loss have developed abnormally high percentages of males and of older people in their populations. These counties have also distorted the national demographic picture in the same direction (Commission on Emigration 1953). One of the purposes of the standardized rates presented here is to discern the impact of this demographic history upon hospitalization rates in Ireland.

Table III provides the data used to compile an age-standardized hospitalization rate for Ireland, using the age-structure of England and Wales as standard. The crude rate per 100,000 population aged 15 and over is 994, the

standardized rate is 1,023; using total population in the denominator, the crude rate is 685 and the standardized rate 788. The Irish population age structure leads to a crude hospitalization rate that slightly *understates* the level of hospitalization for the purposes of comparison with, for instance, England and Wales. This surprising result is due to the higher percentage of Ireland's population aged between 15 and 24 and the low hospitalization rates in this age group.

The hospitalization rate varies considerably between counties in Ireland. Standardized rates by county allow us to see how much of this variation is due to the age and sex structures of the counties and how much to other factors. Ideally standardization should be performed for age and sex groups simultaneously, but this requires the use of age- and sex-specific county rates, which are at present unavailable. However, it has been possible to standardize by sex and age separately. Table IV displays the rates by hospital area standardized by sex and then by age groups. Sex standardization has been performed by applying the national sex-ratio to the rates by sex for each area. The result of this standardization is to reduce the intercounty variation slightly: the coefficient of variation (the standard deviation as a percentage of the mean) falls from 23·38 per cent. to 23·16 per

TABLE IV  
*Hospitalization Rates by Hospital Area: Crude, Standardized by Sex, and Standardized by Age*

Hospital area	Crude	Sex Standardized	Age Standardized
Ardee .. ..	8·51	8·54	8·81
Ballinasloe .. ..	15·26	15·15	14·77
Carlow .. ..	7·03	7·05	7·29
Castlebar .. ..	13·01	13·00	12·36
Clonmel .. ..	11·24	11·09	11·14
Cork .. ..	10·14	10·15	10·03
Ennis .. ..	12·63	12·55	12·01
Enniscorthy .. ..	8·35	8·35	8·19
Dublin .. ..	6·80	6·85	7·21
Kilkenny .. ..	9·76	9·64	9·61
Killarney .. ..	13·18	13·15	13·05
Letterkenny .. ..	9·15	9·10	8·86
Limerick .. ..	9·35	9·35	9·38
Monaghan .. ..	11·45	11·50	10·93
Mullingar .. ..	10·59	10·60	10·44
Portlaoise .. ..	10·20	10·20	10·16
Sligo .. ..	15·79	15·70	14·78
Waterford .. ..	10·96	10·95	10·90
Coefficient of Variation .. ..	23·38	23·16	21·06

cent. It is clear that very little of the observed variation in the rates is attributable to the varying sex-compositions of the counties' populations. In what follows we have had to ignore the influence of sex-composition upon hospitalization, but we believe that this is a minor omission.\*

Age-standardization has been undertaken to remove the effect of each county's age-structure upon its hospitalization rate. Since age-specific rates by county are not available we have used the method of indirect standardization, with the national age-specific rates as standard. The population by age group for each area was applied to the national age-specific rates to obtain the number of patients expected in each area if its age-specific rates were the same as those of the nation. This expected rate was then divided into the national rate and the quotient multiplied by the area's crude rate to obtain the standardized rate (for a discussion of standardization techniques cf. Cox, 1959). Table IV presents the age-standardized rates.

\* It is realized that the variation attributable to both age and sex is not just the sum of the variation due to each, but this, too, is probably a minor qualification.

As a consequence of age-standardization the coefficient of variation falls from 23·38 per cent. to 21·06 per cent. This reduction is far greater than that resulting from sex-standardization, allowing us to conclude that age is a greater source of intercounty variation in crude hospitalization rates than is sex. However, the greatest part of the intercounty variation is not removed by either standardization. From these results we may conclude that the age- and sex-specific rates for Ireland would remain high and continue to exhibit a high level of intercounty variation.

Thus far we have been concerned with the description of Irish hospitalization rates. As Reid (1960) has pointed out, most epidemiological and statistical studies of mental disorders remain in the initial phase of observation. The progress of hypothesis formulation and testing has been slow and too great a divorce exists between the approach of the clinician and his intuitions and that of the epidemiologist and his facts. In the case of Ireland, we believe that socioeconomic forces have an unusually important role to play in the aetiology of mental illness. If this belief is justified it is obvious that

epidemiology has a vital part to play in suggesting and testing hypotheses concerning the interaction between the social environment and the development and prevalence of mental illness. It is possible that findings substantiated for Ireland may suggest insights of a more general validity.

Our ability to test socioeconomic and psychiatric interactions in Ireland is at present limited by the availability of data. The standardized hospitalization rates presented above represent the best available data for this purpose. They are deficient in two ways: first, instead of standardized rates it would be better to have age- and sex-specific rates for each county and secondly, hypotheses of greater psychiatric interest could be tested if we had standardized first admission rates or hospitalization rates by diagnostic classification. However the possibility of improvement and refinement is no excuse for not taking the first step in suggesting and testing hypotheses about the observed pattern of rates.

Our contention is that the age-structure of a county's population influences its hospitalization rate *at all age groups*. By using age-standardized

rates we have netted out the impact of different age-structures on the hospitalization rate, to the extent that the increase in rates at older ages raises the rate in counties with an older than average population. Statistical tests leave little room for doubt that the pattern of standardized rates is associated with the age-structure of the areas' populations. In particular, the higher the percentage of the area's population aged over 65, the higher its hospitalization rate. Table V shows that the proportion of people aged 65 and over in the general population in each area bears little relation to the hospitalization rate of those over 65 in that area.

In order to test the influence of socioeconomic variables adequately, four measures, selected on the basis of epidemiological interest, were studied in connection with the hospitalization rate. These four variables are the percentage of the population aged over 65, the net (out-) migration rate, the level of urbanization and the expenditure on mental health per person in the population. The first variable permits us to study the influence of age-structure on hospitalization, the second could shed light on whether migration is selective of the mentally ill, the

TABLE V

Hospital area	Hospital Rates per 1,000 population of patients over 65	% of Population over 14 aged 65 plus	% of Patients in hospital over 65
Carlow .. ..	40.0	12.3	31.6
Waterford .. ..	24.4	16.6	38.4
Ballinasloe .. ..	21.6	18.6	28.7
Ennis .. ..	19.5	19.8	29.6
Ardee .. ..	18.4	14.3	30.9
Limerick .. ..	17.2	15.1	26.5
Portlaoise .. ..	17.1	16.6	27.0
Mullingar .. ..	17.0	17.1	27.2
Kilkenny .. ..	16.1	17.1	23.2
Cork .. ..	14.1	16.1	25.6
Monaghan .. ..	14.6	18.6	24.9
Killarney .. ..	13.8	18.6	19.7
Sligo .. ..	13.0	19.5	25.1
Enniscorthy .. ..	12.6	17.2	26.2
Dublin .. ..	12.5	12.4	22.5
Letterkenny .. ..	12.3	18.7	24.6
Castlebar .. ..	11.5	21.4	19.4
Clonmel .. ..	10.7	17.1	25.2

Coefficient of correlation between per cent. of patients in hospital over 65  
and per cent. of population over 14 aged 65 plus = 0.19.

TABLE VI

Values of *t*-ratio for regression of age-standardized hospitalization rate on selected socioeconomic variables (sign indicates nature of relation)

Equation Number	% of 14+ population aged over 65	Independent Variable Expenditure on mental health per person	Net Migration Rate	Per Cent. Urban	R <sup>2</sup>
1	5.09*				.594
2	3.17*	1.14			.602
3	2.93*	1.36	-0.82		.593
4	3.52*	1.28	-0.18	1.72	.646
5	3.97*	1.37		1.99†	.667
6	3.79*		0.38	1.81†	.626
7	3.16*		-0.28		.569
8	5.12*			1.85†	.647
9		3.28*			.375
10		1.59	1.13		.386
11		1.53	1.12	0.41	.287
12			3.05*		.328
13			2.36†	-0.44	.292
14				-1.64	.091
15		2.65		-0.34	.339

All variables have been expressed as logarithms.

R<sup>2</sup> = coefficient of multiple correlation squared and corrected for degrees of freedom lost in estimation.

\* = Probability of  $t < .01$  if true coefficient equals zero.

† = Probability of  $t < .05$  if true coefficient equals zero.

third is a substitute for rates by town/rural classification and the fourth tries to measure the influence of availability of mental hospital facilities on hospitalization.

The statistical testing took the form of regressing the hospitalization rate on each of the four variables listed above, singly and in combinations. The use of regression in situations of this type has been widespread for many years now in the social, biological and medical sciences and our data are of the type generally considered consistent with the assumptions of a regression model.

The results of our regression analysis are presented in Table VI. The following influences are warranted from this table, in ascending order of tentativeness:

1. The standardized hospitalization rate is closely associated with the selected socioeconomic variables. The variables can be said to account for over 60 per cent. of the variation in the rate, even after allowing for

the degrees of freedom lost by the use of the regression equations.

2. There is a net positive association between the percentage of the population aged over 65 and the hospitalization rate. This influence persists when other socioeconomic variables are introduced in the regression equation. This supports the psychiatric interpretation mentioned above, relating an abnormal age-structure to high rates of illness.
3. The net influence of mental health expenditure per person is to raise the hospitalization rate. Inclusion of this variable in a regression equation may serve partially to correct the hospitalization rate for the influence of the availability of hospital care and thus make it a truer measure of the prevalence of mental illness in the population.
4. When the influence of age-structure is also taken into account, the net effect of urbanization is to raise the hospitalization rate. This finding is consistent with the hypothesis that

the urban populations have higher rates of illness than rural populations.

5. When the influence of either the county's age structure or their expenditure is taken into account, the net effect of the migration rate upon hospitalization is insignificant. The data therefore would suggest that migrants and non-migrants do not differ with regard to the prevalence of mental illness. Our earlier investigations suggested that significant relations did exist between the migration rate and hospitalization rate, higher rates for schizophrenia and mental defect and lower rates for neurosis being associated with high levels of migration. The present data may conceal such relationships due to their lack of detail with regard to diagnostic groups.

Of all of these relationships that between age-structure and hospitalized rate of mental illness is most striking. The finding that an elderly population is antecedent to increased hospitalization at all age-groups and a major contributor to the high HR of psychiatric illness in Ireland is of considerable interest. The mechanism by which an elderly population increases hospitalized psychiatric morbidity is not clear from the present study, nor are we concerned at this time to speculate as to its nature. It is rather our intention to pursue inquiry in the present manner using specific diagnostic groupings and more refined socioeconomic indicators. In this

way it is hoped to increase the meaningfulness and intelligibility of findings such as those reported in this paper.

#### SUMMARY

An examination of the effect of sex and age structure on psychiatric hospitalization rate and its regional variations in Ireland has been carried out.

Statistical testing, by regression, of the influence of selected socioeconomic variables on hospitalization rate produced some interesting results.

Of most interest was the finding that elderly populations tended to increase hospitalization rate at all age groups.

It is hoped to carry this work further using more refined data.

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