Maternal Age and Incidence of Schizophrenia in the Republic of Ireland

By PER DALÉN

Summary. The excess incidence of schizophrenia reported from Ireland may partly be due to the unusual distribution of the Irish population by maternal age at birth.

Hospital admission rates for mental illness in the Republic of Ireland are extremely high, probably the highest national rates recorded anywhere in the world (Walsh, 1968; Murphy, 1968). Irish first admission rates are also much higher than those in England and Wales. According to Walsh and Walsh (1970), who reported national data for the year 1964, the difference is particularly striking for schizophrenia and personality disorders (including alcoholism). Further national data for 1965–69 (Clare, 1974), and 1970 (Kelleher, Copeland and Smith, 1974) confirm that Ireland has a very high first admission rate for schizophrenia, at least twice that of England and Wales.

Even though the reports published so far offer relatively crude data, there is little doubt that the incidence of mental illness diagnosed as schizophrenia shows an astonishing difference between two neighbouring European countries. There is no reason to believe that Irish and British psychiatrists differ in the way they diagnose schizophrenia, because this problem has been carefully studied without any important divergences coming to light (Kelleher, Copeland and Smith, 1974; Kelleher, 1975).

Explaining the Difference

Possible cultural explanations of this difference were tentatively discussed by Murphy (1968) on the basis of data from Canada, Croatia and Ireland, showing a raised incidence of schizophrenia among Roman Catholics in these countries compared with their non-Catholic compatriots.

Others have discussed demographic peculiarities of the Irish population, such as the low marriage rate and the high rate of emigration. It is true that the single state is associated with a raised incidence of schizophrenia, but this is plausibly explained as an effect of selection due to premorbid personality deviations and to the relatively early age of onset in many cases (Hare, 1967). This selection is, of course, particularly important in a population where marriages occur at a lower rate and at a later age than in most other comparable populations. The low marriage rates of Ireland are therefore not a likely explanation of the high national incidence rates of hospitalized schizophrenia.

It is not obvious that even large-scale emigration would change the incidence of schizophrenia in the country of origin. Ødegård (1932) found a higher incidence of mental disease among Norwegian immigrants in Minnesota than among their contemporaries in Norway. Murphy (1968) cited several early reports of a high incidence of schizophrenia among Irish immigrants in the USA. There are other reports which show the opposite trend. The net effect of emigration on Irish schizophrenia rates is unknown, though probably rather small. Certain regional differences within the country may nevertheless be due to internal migration, as suggested by Walsh and Walsh (1968 and 1970), Kelleher, Copeland and Smith (1974), and Kelleher (1975), see Hare (1967).

The two demographic variables discussed above do not look very promising in the light

of available evidence. This brings us back to Murphy's (1968) discussion of cultural factors. Roman Catholic males in Canada showed higher admission rates for schizophrenia than non-Catholics, and this was so even when cases were subdivided according to ethnic origin. Schooler (1964) studied birth order of schizophrenic patients, finding a significant excess of last-born over first-born among (female) Catholic patients, but not among Protestants. He also studied the effect of different ethnic origins in his Catholic group, and found the same striking preponderance of last-born cases in all ethnic subgroups.*

Maternal age

The attitude of the Roman Catholic Church to contraception markedly influences family size and birth rates at high maternal age levels in Catholic populations. It is likely that the mothers of Schooler's last-born Catholic patients were on the average considerably older than their Protestant counterparts.

During the discussion of Murphy's (1968) paper, Dr Elliot Mishler asked whether the high Irish schizophrenia rates might have to do with the fact that Irish mothers are on average older at the birth of their first child than mothers in other cultures.

The influence of maternal age on the incidence of Down's syndrome and certain other congenital anomalies is well known. Com-

paratively little work has been done on maternal age in mental disorders, but the evidence so far strongly suggests that the mothers of schizophrenics are on the average somewhat older than control mothers.

Barry (1945) reported 584 cases of dementia praecox, in 9·1 per cent of which the mothers had been aged 40 and over at the birth of the patient. Control data from official statistics on US births showed that only 3·9 per cent of all mothers fell in this age group.*

Gregory (1959) found a significant increase of median maternal age in 198 schizophrenic patients born in Canada, 1916–35.

Granville-Grossman (1966) compared 991 schizophrenic patients with their own sibs with respect to maternal age distribution. He found no statistically significant differences, although there was a trend in the expected direction. Moran (1968) criticized Granville-Grossman's statistical treatment of his data and showed that his negative conclusions were unwarranted. There is, in fact, a significant elevation of maternal age in this sample, particularly when data on the general population are used for comparison.

There are three further studies which have the advantage that the authors have provided adequate control data in such a form that expected frequencies in different maternal age classes can be calculated. Their results are sum-

---

* There were 19 first-born, and 54 last-born among Schooler's Catholic patients. This difference is much too large to be attributable to any of the sources of bias discussed by Price and Hare (1969).

* This figure is probably too low, because the control data seem to be from the 1930s, whereas the patients were born between 1890 and 1923 and there was a secular downward trend of maternal age throughout this period (see below).

TABLE I

Distribution of schizophrenic patients by maternal age: data from three studies

Maternal age (years)	Goodman (1957)			Johanson (1958)			Bojanovský and Gerylovová (1967)			Pooled data		
	Ob-served	Ex-pected	O/E	Ob-served	Ex-pected	O/E	Ob-served	Ex-pected	O/E	Ob-served	Ex-pected	O/E
−24	47	75·3	·62	9	16·0	·56	25	65·9	·38	81	157·2	·52
25–29	78	93·0	·84	27	26·3	1·03	54	74·3	·73	159	193·6	·82
30–34	103	71·6	1·44	23	22·7	1·01	52	48·1	1·08	178	142·4	1·25
35+	69	57·1	1·21	28	22·0	1·27	90	32·7	2·75	187	111·8	1·67
Total	297	297·0		87	87·0		221	221·0		605	605·0	

O/E—Ratio of Observed to Expected.

marized in Table I, which also gives the pooled data from all three studies (Goodman, 1957; Johanson, 1958; Bojanovský and Gerylovová, 1967).

Significant increases of maternal age were also found by Norton (1952) in a series of 500 neurotic patients, and by Slater (1962) in a series of 355 homosexuals.

Maternal age in Ireland

Data on Irish live births by maternal age seem not to be available for years before 1955. Table II gives the number of live births to mothers of 35 years and over per 1,000 total live births in various countries throughout the world. The source of these data is the United Nations' Demographic Yearbook, in which the reporting started with the year 1936.

There are only three countries in Table II where more than a quarter of all live births occurred at maternal age 35 and over during the period studied: Ireland (1955 and 1965), Italy (1945), and the Netherlands (1945). The position of Ireland in 1955–65 is clearly unique. There is no reason to believe that the Irish rates were lower before 1955, in view of the general downward trend in other countries during 1936–55.*

Quantitative aspects

The ratios of observed to expected numbers (O/E) in Table I are empirical measures of the relative incidence of schizophrenia at different maternal age levels. Their validity outside the situation where the original data were obtained may not be satisfactory, but if we bear this in mind they may be tentatively used for estimating the contribution of maternal age to variations of the incidence of schizophrenia between populations. The pooled data from three heterogeneous studies represent only 605 patients, but this is probably the best we can find at present.

* This secular trend can be traced in older Swedish statistics as far back as the 1860s. A maximum occurred in the period 1861–65 with 35·7 per cent of live births in the 35+ group, and since then there has been a fairly even decline. Quinquennial data from England and Wales, 1901–40 (Goodman, 1957), and Japanese data from selected years between 1925 and 1968 (Matsunaga, 1973) also show this marked trend.

TABLE II

Number of live births at maternal age 35 years and over per 1,000 live births, by country and year of birth

	1936	1945	1955	1965
America:				
Canada	193	167	151	138
Chile	199	189	176	175
Mexico			142	183
USA	131	132	108	98
Asia:				
Japan			100	45
Taiwan			182	115
Australia.. ..	169	160	131	114
British Isles:				
England and Wales		196	133	109
Republic of Ireland			298	267
Scotland ..		202	136	117
Central and Southern Europe:				
France	152	210	120	136
Italy	221	253	158	157
Netherlands ..	235	263	214	153
Portugal ..	217	237	203	197
Spain	209	226	189	203
Eastern Europe:				
Bulgaria ..			65	56
Czechoslovakia..	150		93	74
Hungary ..			96	67
Poland			123	126
Romania	164		104	91
Scandinavia:				
Denmark ..	160	158	123	82
Finland	227	227	181	143
Norway	238	236	201	133
Sweden	198	190	150	99

Source: United Nations' Demographic Yearbook, 1954, 1959, 1965, 1969.

A simple index of the influence of maternal age on incidence may be calculated from those O/E ratios (*a* in Table III) and the *percentual* maternal age distribution of the population under study (*b* in Table III).

The sum of the products of the *a* and *b* terms across the four maternal age classes will equal 100 if the percentual distribution of the population agrees with that of the expected numbers of the pooled data in Table I. A relative decrease or increase of maternal age results in values below or above 100, and the index value is proportional to the (relative) incidence of schizophrenia, so far as this is determined by maternal age.

TABLE III

Calculation of a maternal age Index from the O/E ratios of the pooled data in Table I (a), *and the percentual distribution of live births in various countries by maternal age* (b)

Maternal age (years)	a	Ireland, 1955		England and Wales, 1955		Japan, 1955		Czechoslovakia, 1955		Sweden, 1900	
		b(%)	ab	b(%)	ab	b(%)	ab	b(%)	ab	b(%)	ab
−24	·52	15·0	7·8	33·8	17·6	28·6	14·9	41·7	21·7	20·5	10·7
25–29	·82	25·8	21·2	31·8	26·1	39·9	32·7	30·0	24·6	25·1	20·6
30–34	1·25	29·4	36·8	21·2	26·5	21·5	26·9	19·0	23·8	22·8	28·5
35+	1·67	29·8	49·8	13·3	22·2	10·0	16·7	9·3	15·5	31·6	52·8
Total			115·6		92·4		91·2		85·6		112·6
Index			116		92		91		86		113

Table III gives such index values based on the 1955 live births in Ireland, England and Wales, Japan and Czechoslovakia, as well as Swedish live births in the year 1900. As might be expected, Ireland has the highest index (116). The ratio of the Irish index to that of England and Wales is 1·26. Under the assumptions made, this means that the difference between the two populations in maternal age distribution accounts for an increase of the incidence of schizophrenia in Ireland of 26 per cent over that in England and Wales.

This estimate should be interpreted with great caution. For one thing, 1955 is not a representative year. The data on first admissions during 1964 given by Walsh and Walsh (1970) refer to a group of patients with birth years roughly between 1900 and 1945. Index numbers representative for these years would certainly be higher for all countries in Table III except Sweden, but since we lack Irish data before 1955 the analysis of this source of error cannot be carried further.

Discussion

If we assume that the incidence of schizophrenia in Ireland is twice that in England and Wales, maternal age would account for about a quarter of the difference. We have been discussing first admission rates, however, and their relation to population incidence is far from clear. Admission rates are influenced by the availability of hospital beds, and by the willingness of patients to be admitted (nosocomial factors, as discussed by Hare, 1967). The difference between Ireland and England and Wales may therefore be somewhat exaggerated by factors which are irrelevant to our present problem. If that is so, the importance of maternal age as an explanation of the difference would be correspondingly greater.

There is a statistical association of schizophrenia with advanced maternal age, but we know very little about causal connections. Moran (1968) discussed three classes of possible causes: gene mutations, other (e.g. intra-uterine) biological influences, and a difference in the psychological influence of the older parents on their offspring (including an increased risk of parental loss). Little or nothing can be added to this list, or to Moran's discussion, because in recent years this problem seems to have attracted little attention. It is nevertheless an important problem. Mean maternal age has been decreasing in most countries throughout the world during our century. If there is a causal connection between maternal age and schizophrenia, we can predict a continuous decrease in the incidence of this disease.

References

BARRY, H., JR (1945) Incidence of advanced maternal age in mothers of one thousand state hospital patients. *Archives of Neurology and Psychiatry (Chic.)*, 54, 186–91.
BOJANOVSKÝ, J. & GERYLOVOVÁ, A. (1967) Die Beziehung der Schizophrenie zum Alter der Eltern der Patienten. *Nervenarzt*, 38, 40–2.

CLARE, A. W. (1974) Alcoholism and schizophrenia in Irishmen in London—a reassessment. *British Journal of Addiction*, 69, 207–12.

GOODMAN, N. (1957) Relation between maternal age at parturition and incidence of mental disorder in the offspring. *British Journal of Preventive and Social Medicine*, 11, 203–13.

GRANVILLE-GROSSMAN, K. L. (1966) Parental age and schizophrenia. *British Journal of Psychiatry*, 112, 899–905.

GREGORY, I. (1959) An analysis of family data on 1,000 patients admitted to a Canadian mental hospital. *Acta Genetica (Basel)*, 9, 54–96.

HARE, E. H. (1967) The epidemiology of schizophrenia. In *British Journal of Psychiatry—Special Publication No. 1*, 9–24. Ashford, Kent: Headley Bros Ltd.

JOHANSON, E. (1958) A study of schizophrenia in the male. *Acta Psychiatrica et Neurologica Scandinavica*, 33, Suppl. 125.

KELLEHER, M. J. (1975) The relevance of diagnosis to the epidemiology and teaching of psychiatry. *Irish Journal of Medical Science*, 144, 49–54.

—— COPELAND, J. R. M. & SMITH, A. J. (1974) High first admission rates for schizophrenia in the west of Ireland. *Psychological Medicine*, 4, 460–2.

MATSUNAGA, E. (1973) Effect of changing parental age patterns on chromosomal aberrations and mutations. *Social Biology*, 20, 82–8.

MORAN, P. A. P. (1968) Maternal age and parental loss. *British Journal of Psychiatry*, 114, 207–14.

MURPHY, H. B. M. (1968) Cultural factors in the genesis of schizophrenia. In *The Transmission of Schizophrenia* (eds D. Rosenthal and S. S. Kety). Pergamon Press.

NORTON, A. (1952) Incidence of neurosis related to maternal age and birth order. *British Journal of Social Medicine*, 6, 253–8.

ØDEGÅRD, Ø. (1932) Emigration and insanity. *Acta Psychiatrica et Neurologica (Kbh.)*, Suppl 4.

PRICE, J. S. & HARE, E. H. (1969) Birth order studies: some sources of bias. *British Journal of Psychiatry*, 115, 633–46.

SCHOOLER, C. (1964) Birth order and hospitalization for schizophrenia. *Journal of Abnormal and Social Psychology*, 69, 574–9.

SLATER, E. (1962) Birth order and maternal age of homosexuals. *Lancet*, i, 69–71.

WALSH, D. (1968) Hospitalized psychiatric morbidity in the Republic of Ireland. *British Journal of Psychiatry*, 114, 11–14.

—— & WALSH, B. (1968) Some influences on the inter-county variation in Irish psychiatric hospitalization rates. *British Journal of Psychiatry*, 114, 15–20.

—— —— (1970) Mental illness in the Republic of Ireland—first admissions. *Journal of the Irish Medical Association*, 63, 365–70.

Per Dalén, M.D., *Associate Professor of Psychiatry, University of Göteborg, St Jörgen's Hospital, 422 03 Hisings Backa, Sweden*