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Seasonal variation in admissions of psychiatric patients and its relation to seasonal variation in their births

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SUMMARY Inpatient admissions to all psychiatric hospital beds in England and Wales in 1970-73 were studied by month of admission for eight diagnostic groups. The admission rates for schizophrenia showed a pronounced seasonal variation, with a maximum in summer. The seasonal pattern for schizophrenia was very similar to the one shown for mania, although somewhat less marked. The admission rates for neurosis and for the large group of 'all other non-psychotic mental illness' showed little evidence of seasonal variation, and such variation as there was could largely be explained by social factors. In schizophrenic and manic patients, the pattern of seasonal admissions (peak months July and August) is similar to the pattern reported for their births (peak months February and March). This is consistent with the hypothesis of an abnormal seasonal pattern of parental conception as the cause of the abnormal birth pattern.

It has been known since the time of Esquirol that the number of patients admitted to mental hospitals tends to be higher in the summer than in the winter; and there has been a general consensus since the paper by Kollibay-Uter (1921) that the fluctuations, so far as psychotic cases are concerned, have a biological rather than a social cause. The literature has been reviewed by Abe (1963). For the functional psychoses (schizophrenia and manic-depression), cyclic variation in admission rates, with a peak in early summer, has been reported from Zurich (Meier, 1922), Wisconsin (Petersen, 1934), and Japan (Abe, 1963). For England and Wales, a similar seasonal variation in admissions for mania has been reported by Symonds and Williams (1976). But there have been no reports (apart from that of Faust and Sarreither (1975) who give no figures) on the seasonal admissions of non-psychotic patients; and there remains some uncertainty how far the variation described in psychotic cases may be a feature of all diagnostic categories and so perhaps might be the consequence of a fluctuating availability of inpatient beds.

We report here on seasonal variation in admissions of psychiatric patients in England and Wales by diagnostic groups, and compare psychotic with non-psychotic cases. We were led to make this study for the following reason. There is now good evidence that patients with schizophrenia, mania, and (although less well substantiated) psychotic depression are born more often than expected in the first quarter of the year (Hare, 1975a, b). Further studies (Hare, 1976; McNeil *et al.*, 1976) indicate that the siblings of such patients have the same abnormal seasonal birth pattern. This supports the hypothesis that the parents of patients with a functional psychosis have an abnormal pattern of conception. It is well accepted that the parents of such patients often have the constitutional traits of schizothymia or cyclothymia. If there is a seasonal variation of biological origin in the onset or severity of the functional psychoses (as reflected in the admission rates), then there is likely to be a similar rhythm in the corresponding constitutional traits; and if, as it is not unreasonable to suppose, this leads to a heightening of sexual drive in the late spring, that would account for the excess of births of the patients in the early months of the year. But the abnormal seasonal pattern of births of psychotic patients is not found for patients with neurosis or personality disorder, and on the parental conception hypothesis we should expect a relative absence of

rhythmicity in the onset or severity of disorders due to neurosis and personality disorder and hence an absence of a cyclical seasonal variation in their admissions, except in so far as variation might be caused by social factors.

Method

Through the Mental Health Enquiry of the Department of Health and Social Security (DHSS), routine data are collected on all admissions to psychiatric hospitals and units in National Health Service hospitals in England and Wales. The DHSS has made available to us information on the yearly numbers of first and other admissions during 1970-73, by month of admission and by eight diagnostic groups. The DHSS has also given us information by month of birth and the same diagnostic groups, for all patients who were born in England and Wales and were admitted for the first time to a psychiatric bed in England and Wales during 1970-75.

Results

Table 1 gives the total monthly admissions (sexes combined) for the eight diagnostic groups over the four-year period. Inspection shows—and this can readily be confirmed by calculating the rates to eliminate the effect of the different number of days in the months—that there is a marked seasonal variation in admissions for schizophrenia, with a maximum in June and July. But our concern is to search for a seasonal variation which cannot readily be attributed to social factors, so we first tried to allow for seasonal variation common to all diagnostic groups which might reasonably be attributed to social factors. In seven of the eight diagnostic groups (the exception is the group of 'other psychoses') the number of admissions in January is notably higher than in December or February. The most probable explanation of this is that patients are not so readily admitted to hospital over the Christmas holiday in December and that the resulting backlog is to some extent made up in January. This explanation is supported by the fact that sickness absence decreases in Christmas week and increases in the first week in January (Pocock, 1974). August is also a month in which the number of admissions tends to be lower than in the months immediately before or after, and this again is likely, in part at least, to be due to the effect of the August holidays with some backlog being made up in September.

If this is accepted, then the effect of the winter and summer holidays on the numbers of admissions can to some extent be allowed for by considering numbers of admissions in six two-monthly groups—that is, December-January, February-March, etc. Figure 1 shows the rates of admission, in two-month groups, for four diagnoses. Schizophrenia and mania show a fairly smooth seasonal variation, quite different from the neuroses. For psychotic depression, the cycle of variation is similar to that of mania but is less marked and its peak occurs about a month earlier.

We need to consider whether the seasonal pattern of admissions will be influenced by the age of patients. The diagnostic group with the largest variation in monthly admission rates is the group of 'other psychoses' which has a relatively higher admission rate for the three-month period December-February than any other group. 'Other psychoses' contain the large group of senile psychoses and the high admission rates for December to February are understandable in terms of the effect of winter on the general health of elderly persons. We have no figures for age at admission but it seems unlikely

Table 1 *Number of admissions (all ages, sexes together) to psychiatric beds in England and Wales 1970-73 by diagnosis and month of admission*

Month of admission	*Schizophrenia*	*Mania*	*Psychotic depression*	*Other psychoses*	*Neurotic depression*	*Other neuroses*	*Personality disorder*	*All other non-psychotic mental illness*
January	10 750	1 596	7 036	11 279	4 651	4 543	5 005	20 653
February	9 368	1 381	6 379	9 353	4 288	4 066	4 421	18 101
March	10 289	1 409	7 048	9 453	4 656	4 289	4 843	19 746
April	10 059	1 480	6 967	9 042	4 370	3 980	4 568	19 085
May	10 814	1 663	7 208	9 691	4 720	4 160	4 849	20 541
June	11 075	1 714	7 573	9 758	4 731	4 145	4 931	20 831
July	11 383	1 824	7 286	9 924	4 677	4 164	5 274	21 148
August	10 720	1 746	7 025	9 447	4 322	3 928	4 920	19 629
September	10 813	1 641	7 048	9 029	4 471	4 010	4 635	19 783
October	10 623	1 675	7 285	9 365	4 856	4 382	4 952	20 630
November	9 946	1 578	7 070	9 209	4 528	4 091	4 798	20 131
December	9 367	1 427	6 588	9 357	3 940	3 255	4 375	18 535
Total admissions	125 207	19 134	84 513	114 907	54 210	49 013	57 571	238 813

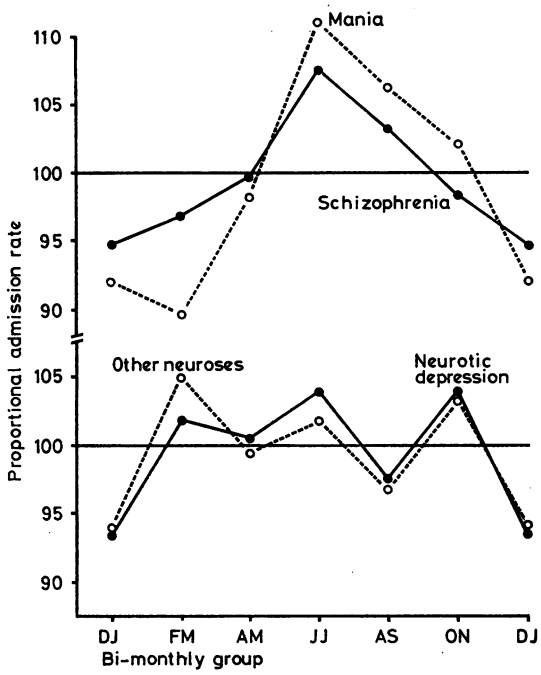

Fig. 1 *Two-monthly admission rates, England and Wales 1970-73, for four diagnostic groups. Rates expressed as proportion, per cent, of average daily rate for the year.*

that, apart from the senium, age will have much influence on season of admission. Schizophrenia and mania have very similar seasonal patterns of admission but have widely different age distributions. On the other hand, the distribution of schizophrenic patients (when the sexes are combined) is commonly very similar to that of neurotic patients (Hare *et al.*, 1971), yet the seasonal distribution of admissions in the two diagnostic groups is very different.

The effect of gender on seasonal variations in admission must also be considered. We have no figures for this but the admission figures given for mania by Symonds and Williams (1976) show a monthly distribution which is similar for the sexes ($\chi^2_{11} = 8{\cdot}5$, $P > 0{\cdot}5$). In so far as seasonal variation in admission rate may be caused by biological variations in severity, we should not expect to find any marked sex difference.

In so far as social causes for admission are operative, one might expect that the more severe the illness, the more likely it is that the admission rate will be independent of season. This may explain why, for the month of December (as opposed to November and January), the proportional admission rates for schizophrenia and mania are higher than for neurosis. Yet for the year as a whole, the functional psychoses show much more seasonal variation in admission rates than the neuroses or personality disorder; and indeed, of all the diagnostic groups, those with the least seasonal variation are the neuroses.

The differences between the diagnostic groups in seasonal admission rates are generally similar for each of the four years of admissions. Table 2 compares schizophrenia with neurosis in this respect. The data from the DHSS also show that within each diagnostic group the seasonal pattern for first admissions is similar to that for all admissions.

Table 2 *Number of admissions for schizophrenia by month and year of admission, expressed as percentage of the numbers expected from admissions for neurosis*

Month of admission	*1970*	*1971*	*1972*	*1973*	*1970–73*
January	93	98	94	100	96
February	87	97	96	90	92
March	95	92	95	99	95
April	97	105	94	102	99
May	108	99	97	98	100
June	107	102	103	99	103
July	107	108	100	109	106
August	115	100	107	108	107
September	103	103	112	102	105
October	94	95	101	89	95
November	92	97	94	97	95
December	106	106	109	109	107
Total admissions					
Schizophrenia	33 047	31 305	30 493	30 362	125 207
Neurosis	26 131	26 302	26 305	24 485	103 223
χ^2 (11 d.f.)	90·4	31·2	49·7	53·3	149·2

The seasonal trend for the admission of schizophrenic and manic patients can be analysed in terms of a comparison with other diagnoses by the method of Walter and Elwood (1975). The idea of adjusting the frequencies of an event (for example, an admission for schizophrenia) in a numerator according to the frequencies of another event (for example, an admission for mania) in the denominator which does not include the numerator is a slightly new application of this method. The rationale for this is that one supposes that both events are seasonally distributed, but that the adjustment for the comparison event (the denominator) will reveal the 'true' seasonal pattern in the event of primary interest (the numerator). In the particular applications here, one might imagine that new cases of a disorder are seasonal, but that the probability of such cases being recognised and becoming hospital admissions is also seasonal. By weighting according to another appropriate disorder, one attempts to remove this nuisance seasonal trend in diagnosis and to expose the underlying trend in disease incidence.

The results of such an analysis are shown in Tables 3 and 4. In these the two groups of neuroses have been combined into a single category, since it is clear from Fig. 1 that they have a similar seasonal pattern of admission. We think neurosis is the most suitable diagnostic category to compare the admission trends in schizophrenia and mania, because the category of all other non-psychotic mental illness includes a considerable proportion (probably not less than 50%) of patients given the diagnosis 'depression not otherwise specified' and because personality disorder is not, technically speaking, an illness. Yet if instead we take the group of all non-psychotic disorders—neurosis, personality disorder, and all other non-psychotic mental illness together—the adjusted seasonal trend for schizophrenia and mania still departs very significantly from expectation.

Our findings for seasonal trends in admission may be compared with the seasonal trends in births of psychotic patients. Table 5 shows the monthly distribution of births of patients born in 1921-55 and first admitted in 1970-75. The relationship between the distribution of these patients' births and that of all live births in the general population has been reported elsewhere (Hare, 1975a, b): for patients with schizophrenia and mania, there is a significant excess (over expectation) of births in the first quarter of the year. Table 6 shows that the seasonal trends of births of patients with schizophrenia or mania are significantly different from that of neurosis when examined by the test of Walter and Elwood (1975). If the monthly number of births and admissions for schizophrenia and mania are expressed as a proportion of the corresponding numbers for neurosis, the result (as a three-month running average) can be seen in Fig. 2. It is worth noting that the size of the seasonal swing is similar for births and for admissions in both diagnostic groups. For schizophrenia, the estimated amplitude of variation (the percentage change from the average rate to the maximum rate) is 4·9% for births and 4·7% for admissions. For mania, the corresponding figures are 8·3% and 9·5%.

Table 3 *Significance of seasonal trend in admissions for schizophrenia, adjusted for various comparative diagnoses*

Comparative diagnosis	χ^2_3 *for adjusted seasonal trend in schizophrenia*	*Month of schizophrenia peak (adjusted)*
Psychotic depression	32·6	mid July
Other psychoses	393·7	late July
Neurosis	140·7	late July
Personality disorder	41·0	early July
All other non-psychotic mental illness	58·1	early July
All non-psychotic disorder*	69·4	mid July

*Neurosis, personality disorder, and all other non-psychotic mental illness

Table 4 *Significance of seasonal trend in admissions for mania, adjusted for comparative diagnoses*

Comparative diagnosis	χ^2_3 *for adjusted seasonal trend in mania*	*Month of mania peak (adjusted)*
Neurosis	87·7	mid August
Personality disorder	46·8	mid August
All other non-psychotic mental illness	50·7	early August
All non-psychotic disorder	58·6	mid August

Table 5 *Numbers, by month of birth and diagnosis, of all patients who were first admitted to a psychiatric bed in England and Wales 1970-75 and who were born in England and Wales 1921-55*

Month of birth	*Schizophrenia*	*Mania*	*Psychotic depression*	*Other psychoses*	*Neurosis*	*Personality disorder*	*Other**
January	1 245	159	719	764	2 761	1 059	4 330
February	1 144	173	690	706	2 644	964	4 084
March	1 273	176	815	765	3 144	1 165	4 768
April	1 170	180	749	795	2 967	1 107	4 692
May	1 268	162	796	825	3 162	1 162	4 918
June	1 245	168	731	739	2 946	1 047	4 527
July	1 139	159	715	753	3 068	1 168	4 565
August	1 023	142	688	714	2 697	1 140	4 277
September	1 041	131	648	713	2 658	1 010	4 153
October	1 041	139	678	675	2 621	976	4 133
November	974	138	650	686	2 619	899	3 844
December	1 050	151	717	714	2 721	1 058	4 120
Total	13 613	1878	8596	8849	34 008	12 755	52 411
Month of birth not known	194	24	67	118	236	114	522

*All other non-psychotic mental illness

Table 6 *Significance of seasonal trend in births for various diagnoses, adjusted for seasonal trend in births for neurosis*

Diagnosis	χ^2_3 *for adjusted seasonal trend*	*P*	*Month of peak*
Schizophrenia	15·5	<0·001	Late February
Mania	6·1	<0·05	Late February
Psychotic depression	5·2	NS	Late January
Other psychoses	2·5	NS	Late December
Personality disorder	2·7	NS	Late August
All other non-psychotic mental illness	0·75	NS	Early June

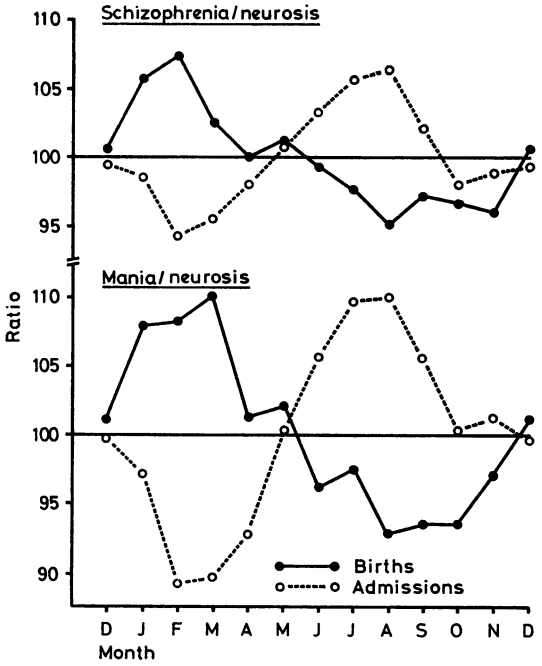

Fig. 2 *Monthly births and admissions for schizophrenia and mania, expressed as a percentage of the number expected on the basis of births and admissions for neurosis: three-monthly running averages.*

Births of 13 613 schizophrenic, 1878 manic, and 34 008 neurotic patients born in England and Wales 1921-55 and first admitted there 1970-75. Admissions (all ages) in England and Wales 1970-73; 125 207 for schizophrenia, 19 134 for mania, 103 233 for neurosis.

Discussion

These findings confirm those from other countries of a marked cyclic variation in admissions for schizophrenia. Both in absolute numbers, and in comparison with admissions for neurosis, admissions for schizophrenia had a maximum about July and a minimum about January. The same seasonal variation was found for mania (sexes combined). Admissions for psychotic depression showed the same seasonal trend as those for mania but to a lesser degree. It is worthy of note that the smaller seasonal variation in admissions for psychotic depression, as compared with mania, also occurs for the births. One might have expected that these two diagnostic groups would show a similar degree of seasonal variation. A possible explanation of the smaller variations in psychotic depression is that this group comprises bipolar and unipolar types and that it is only the bipolar type which shows seasonality.

Abe (1963) allowed for the possibility that the seasonal variation in admissions might be caused by fluctuations in the availability of beds by excluding hospitals in which the number of patients was more than 2% in excess of the number of registered beds. In England and Wales there are no figures for overcrowding in mental hospitals during 1970-73; but the fact that the total number of patients decreased from 120 000 in 1966 to 108 000 in 1970 and then steadily to 95 000 in 1973, while the yearly numbers of admissions remained practically constant during 1970-73 (Department of Health and Social Security, 1977), strongly suggests that shortage of beds was not likely to have been a significant factor in the monthly numbers of admissions. Moreover, if such shortage had been a factor, it would probably have applied more strongly to admissions for neurosis and personality disorder than for schizophrenia and mania, yet it is the last two groups that had the more marked seasonal variation. We conclude that the observed variation must mainly be due to biological rather than social causes, and therefore that seasonally varying biological factors are much less marked in non-psychotic mental disorder than in the functional psychoses. This conclusion accords with the hypothesis that the abnormal seasonal pattern of births of patients with functional psychosis is due to an abnormal pattern of parental conception (related to constitutional traits of schizothymia and cyclothymia) in their parents.

Compared with births in the general population or with births of neurotic patients, the seasonal peak of psychotic births occurs about February (Table 6), indicating a peak of parental conception about May. The seasonal peak of psychotic admissions occurs in July and August. This difference in time between the peak for conceptions and for admissions could be accounted for by supposing that a biological over-activity occurs about May both in psychotic patients and in those carrying the corresponding constitutional traits, but that in the former group a further period elapses before the disturbance becomes severe enough to

necessitate the patient's admission to hospital. It would be possible to test whether patients with schizophrenia or manic-depression become more sexually active in May by studying the month of birth of their children.

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