

# Further observations on seasonal variation.

## 2. Depression

CONRAD M. HARRIS, MEd, FRCGP  
Senior Lecturer, Department of General Practice,  
St Mary's Hospital Medical School, London

**SUMMARY.** In an earlier study consultations for depression in general practice were shown to peak in the late spring and autumn, the pattern being similar to that found in hospital admission data and suicide statistics. There were differences, however, and these gave grounds for speculation about differences between the milder depressions typical of general practice and more severe depressions. To test the reliability of the findings, national prescribing figures over three years and general practice morbidity recordings over five years held by the Office of Population Censuses and Surveys were analysed. In these larger data sets the differences were no longer apparent, but there was evidence of a precipitating factor which varied in timing and magnitude from year to year, particularly in the autumn. This might account for inconsistencies in the seasonal variation noted in studies of hospital and suicide data.

### Introduction

IN an earlier paper<sup>1</sup> it was reported that the number of consultations for depression in a group of London practices was greatest in late spring and again about six months later. This was not unexpected, since a similar pattern has been noted in national suicide data and in analyses of admission to hospital, but it was the first evidence of a seasonal variation documented in general practice. However, the study had inherent limitations: the data covered only one year, they came from a population of only 32 500 patients and the doctors had made their diagnoses without any agreed criteria. To investigate any further it would be necessary to work with records of a much more substantial nature.

The timing of the spring peak in consultations for depression was of interest. Studies based on hospital data and suicide statistics are not unanimous about which months are most important, but there is a considerable consensus for March to May; in the London practices the rise took place in May and June.<sup>1</sup> The difference might have been due to chance, but a factor which varied in timing from year to year could be responsible, or more severe forms of depression could be appearing before milder ones.

The autumn peak in consultations for depression posed more subtle problems. It is striking that in the literature some authors have found only a small second peak and others have not observed one at all. The inference has been that depression is most common in the spring, though it would be fairer to conclude that this is the time when the kind of depression which leads to hospital admission or suicide is most frequent. In this connection it is intriguing that Eastwood and Peacocke<sup>2</sup> were prepared to state that psychotic depression is predominant in the spring and neurotic depression in the autumn.

The depression seen by general practitioners is nearly always diagnosed as neurotic or reactive and does not often lead to hospital admission or suicide. Despite the hazard of an imprecise terminology it is therefore tempting to hypothesize that the

autumn peak will be particularly important in general practice, and this was in fact the case in the London study where it was found that the autumn peak was about as great as the spring peak and that it went on for a month longer.

Two sources of information seemed suitable for study: the national monthly totals of dispensed prescriptions for antidepressant preparations and the morbidity recordings from general practice, mainly unpublished, held by the Office of Population Censuses and Surveys (OPCS) from practices which went on recording after the second national morbidity study (1970–71). Both sets of data could be used to search for further evidence of two significant peaks and to test the hypothesis that they would occur in the months indicated by the London study: May and June, and November to January.

### Method

The Statistics and Research Division of the Department of Health and Social Security (DHSS) provided the number of prescriptions for antidepressant and antidepressant combination preparations dispensed in England each month from January 1981 to December 1983 estimated from a one in 200 sample of all prescriptions. Differences in the lengths of the months were allowed for by calculating the number of prescriptions per standard working month.<sup>3</sup>

The consultation data supplied by the OPCS for the five-year period December 1971 to November 1976 presented problems which have been described in full in the preceding paper.<sup>3</sup> The number of first consultations in each of the 60 months was converted into the total per standard working month. A diagnosis of depression implies only that the doctor concerned recorded either 'neurotic depression' or 'affective disorder' at the consultation (the former accounting for more than 92% of the total). These headings were from the eighth revision of the *International classification of diseases*.<sup>4</sup>

The statistical methods used to determine seasonal trends in three years of prescriptions and in five years of first consultations with a different population each year are described in Appendix 1.

### Results

#### Spring peak

The distribution of prescriptions per standard working month over 36 months showed a spring peak in each year, involving April and May in 1981 and 1982 but mainly April in 1983. The mean values for the three standard working Januarys, Februarys and so on, shown in Figure 1 put the peak in April and May. In terms of the research hypothesis, an analysis of deviance (Appendix 1, Table 1) revealed no significant increase in May and June, but a significant increase for March to May ( $P < 0.01$ ).

Figure 2 shows the distribution of first consultations over a 'year' which consists of five standard working Januarys, Februarys and so on. Since first consultations will tend to come earlier rather than later in a recording period, a random distribution would produce a steady decrease from the first month to the last, though it cannot be plotted because of changes in the patient population each year.

Two deviations from this steady decrease can be seen. The first reaches a maximum in May while the second has its highest point in September. The underlying pattern is easier to appreciate in Figure 3 which displays the excess consultations in each month after linear modelling (Appendix 1). The peak from March to May was very pronounced, and an analysis of deviance

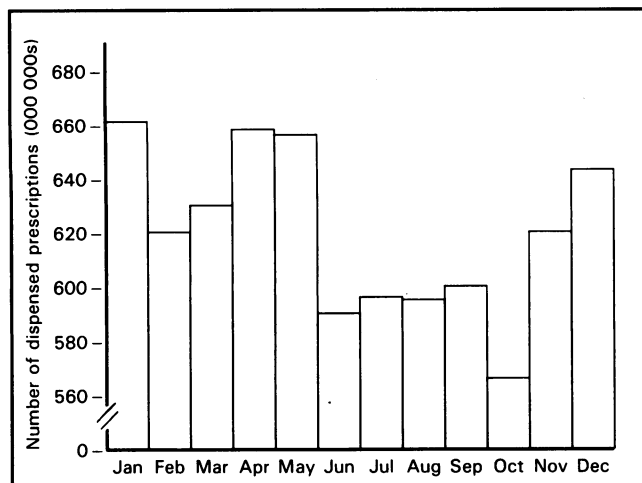


Figure 1. Mean number of dispensed prescriptions (millions) for antidepressant and antidepressant combination preparations (millions) in the standard working months 1981-83.

(Appendix 1, Table 4) confirmed it: first consultations were significantly increased in May and June ( $P < 0.001$ ) and in March to May ( $P < 0.001$ ).

Both the prescribing data and the consultation data thus confirm the existence of a spring peak but put it a month or two earlier than the study in the London practices suggested.

**Autumn peak**

The numbers of antidepressant preparations prescribed showed small peaks in November and December in both 1981 and 1982, the latter going on to a much higher point in January 1983; in 1983 only December seemed to be important. Figure 1 suggests a November to January timing.

To remove the effect of the spring peak, the research hypothesis that November to January would be the period of significant increase was tested for the six months of autumn and winter September - February. An analysis of deviance (Appendix 1, Table 1) supported the hypothesis ( $P < 0.05$ ).

The autumn peak in first consultations (Figures 2 and 3) is clearly small. The analysis of deviance of the standardized

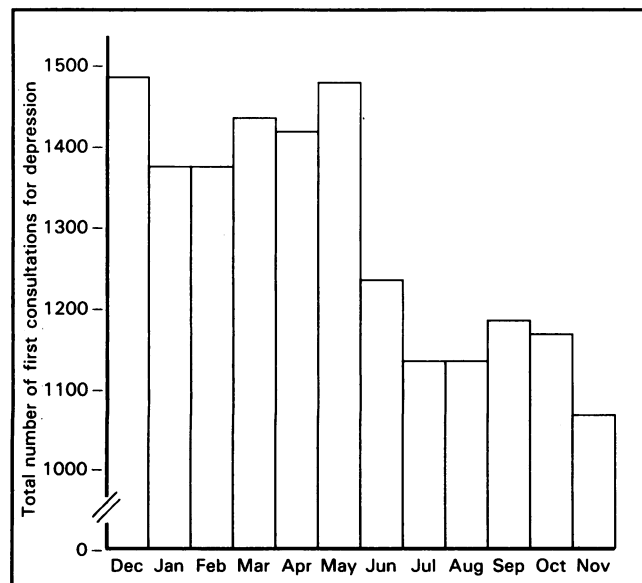


Figure 2. Total number of first consultations for depression in OPCS recording practices per standard working month for the period 1971-76.

residuals after linear modelling (Appendix 1, Table 4) showed no significant excess in November - January compared with the rest of the autumn and winter months. The small excess in September and October was not significant.

Thus there is evidence for a second peak from November to January in the prescribing data but not in the consultation data, where the increase which takes place in September and October is too small to be significant.

**Discussion**

These two large sets of data give results which differ from those of the London study: a well-confirmed spring peak comes, with a little variability, between March and May rather than in May and June while the status of an autumn peak is equivocal. In other words the pattern found in general practice is the same as that in studies based on hospital admissions and suicide figures. This narrows the field for speculation considerably.

The size of the two new data sets makes it unlikely that the findings are due to chance, even allowing for the vagaries of diagnostic terminology. The milder forms of depression seen in

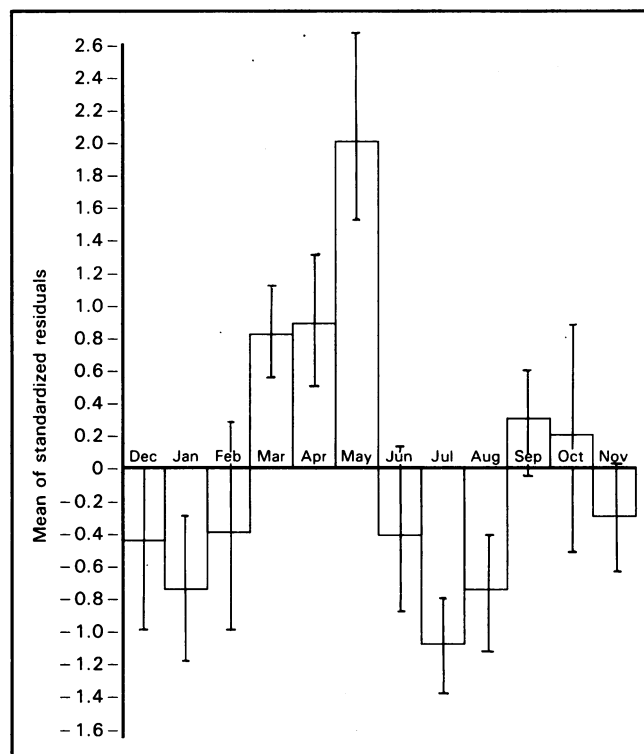


Figure 3. First consultations for depression: means and standard errors of standardized residuals after linear modelling for the standard working months.

general practice do not appear to have a timing different from that of more severe depression so that there is no reason to suppose a different seasonal mix of the psychotic and neurotic varieties in the two situations. On the other hand, the way in which the figures both for prescriptions and first consultations (Appendix 1, Table 2) vary each year strongly suggests the existence of a precipitating factor which differs in its timing and probably in its magnitude from year to year, though not as markedly in the spring as in the autumn. If there is such a factor operating, the findings in the London practices in 1980 can be regarded as falling within a normal range and inconsistencies in the results of analyses of hospital admissions and suicide statistics may also be accounted for. The nature of this factor remains to be discovered.

References

- Harris CM. Seasonal variations in depression and osteoarthritis. *J R Coll Gen Pract* 1984; **24**: 436-439.
- Eastwood MR, Peacocke S. Seasonal patterns of suicide, depression and electroconvulsive therapy. *Br J Psychiatry* 1976; **129**: 472-475.
- Harris CM. Further observations on seasonal variation. 1. Osteoarthritis. *J R Coll Gen Pract* 1986; **36**: 316-318.
- World Health Organization. *Manual of the international statistical classification of diseases, injuries and causes of death*. 8th revision. Volume 1. Geneva: WHO, 1967.

Acknowledgements

I thank David Birch of the Medical Statistics Division, OPCS, and Mr I.D. Spooner and Mr P.O. Matthews of the Statistics and Research Division of DHSS for their help. The data furnished by both OPCS and DHSS are Crown copyright and reproduced with the permission of the Controller of Her Majesty's Stationery Office. I also thank Dr John Fry of P.N. Lee, Statistics and Computing Ltd for his help with the statistical analyses.

Address for correspondence

Professor C.M. Harris, Department of General Practice, Clinical Sciences Building, St James's Hospital, Leeds LS9 7TF.

Appendix 1

Prescribing data

The estimated monthly figures for dispensed antidepressants and antidepressant combination preparations for England, 1981-83, were converted into totals per standard working month. Taking the distribution to be approximately Poisson, an analysis of deviance was performed and the results are shown in Table 1.

Consultation data

The monthly figures for first consultations for depression in the OPCS recording practices from December 1971 to November 1976 were converted into totals per standard working month and are shown in Table 2. The five years had considerably different monthly patterns though May was always higher than either April or June. Table 2 also gives the population at risk for each year.

The use of first consultations produces a biased monthly trend which must be removed as far as possible before an attempt is made to look for a genuine seasonal trend within the data. The technique of linear modelling was used for this purpose.<sup>3</sup> The effects of fitting the various parameters of the model are shown in Table 3. There were statistically strong effects both for year and for month within year, but, since the fit was not exact the standardized residuals were inspected and revealed a major rise from March-May, with possibly a small second peak in September and October (Figure 3). The results of the analysis of deviance of the standardized residuals are shown in Table 4.

Table 1. Prescriptions for antidepressant and antidepressant combination preparations dispensed over years 1981-83 in England, by standard working month: analysis of deviance (Poisson model: log link).

	Deviance	df	
Grand mean	453.2	35	
Constant for each year	440.6	33	NS
Constant for each month over years	193.6	24	P<0.05
May, June different from rest of months over years	450.0	34	NS
March-May different from rest of months over years	373.8	34	P<0.01
Sept-Feb same over years	241.5	17	
Nov-Jan different from Sept, Oct, Feb over years	161.6	16	P<0.05

df = degrees of freedom. NS = not significant. NB: Lack of fit of model allowed by tracing.

Drop in deviance/Drop in df,  $\sim F(\text{Drop in df, Final df})$ .  
Final deviance/Final df

Table 3. First consultations for depression in OPCS recording practices, December 1971-November 1976: analysis of deviance (Poisson model: log link).

	Deviance	df	
Grand mean only	7028.0	59	
Constant for each year	257.7	55	P<0.001
+ slope over months within year	127.7	54	P<0.001
+ different slope over months within each year	93.7	50	P<0.001
	Estimates	SE	
Grand mean	6.703	0.023	
less: 1972-73	-1.127	0.046	
1973-74	-1.620	0.054	
1974-75	-1.641	0.055	
1975-76	-1.702	0.057	
Slope for 1971-72	-0.041	0.003	
1972-73	-0.027	0.006	
1973-74	-0.009	0.007	
1974-75	-0.011	0.007	
1975-76	-0.013	0.007	

df = degree of freedom. SE = standard error.

Table 4. First consultations for depression in OPCS recording practices, December 1971-November 1976: analysis of deviance of standardized residuals after linear modelling (normal model: identity link).

	Deviance	df <sup>a</sup>	
Grand mean	94.15	50	
May, June different from rest of year	86.41	49	P<0.01
March-May different from rest of year	63.37	49	P<0.001
Sept-Feb	34.75	25	
Nov-Jan different from Sept, Oct, Feb	32.70	24	NS
Sept, Oct different from Nov-Feb	31.46	24	NS

<sup>a</sup> Degrees of freedom are down since parameters have already been fitted to produce these residuals.

Table 2. Number of first consultations for depression in OPCS recording practices in each standard working month from December 1971 to November 1976.

Standard working month	Number of first consultations for depression					Total
	1971-72 (n = 256 675)	1972-73 (n = 124 325)	1973-74 (n = 102 679)	1974-75 (n = 105 664)	1975-76 (n = 103 767)	
December	809.8	221.0	141.0	158.3	149.7	1479.8
January	686.8	249.4	145.8	151.5	142.7	1376.2
February	686.3	238.4	181.5	140.3	127.7	1374.2
March	714.5	242.7	175.8	166.6	141.3	1440.9
April	704.1	254.3	157.2	145.8	155.1	1416.5
May	725.1	265.7	168.8	153.7	162.5	1475.8
June	588.9	237.1	137.2	150.7	117.0	1230.9
July	542.6	188.0	135.8	141.3	127.6	1135.3
August	537.1	208.1	140.7	140.3	110.5	1136.7
September	535.1	214.2	153.7	135.2	140.0	1178.2
October	552.4	168.8	136.7	153.2	140.7	1151.8
November	482.4	182.2	156.7	132.9	121.9	1076.1

n = patient population.