

## EDITORIAL

# Epidemiology and seasonal affective disorder<sup>1</sup>

In 1984, Rosenthal and his coworkers coined the term 'Seasonal Affective Disorder' to describe a condition characterized by 'recurrent depressive episodes that occur annually'. Sufferers were said to become depressed in the autumn or winter and to recover in the spring or summer. It was posited by the authors that 'Seasonal Affective Disorder' is a subgroup of the affective disorders. Furthermore, it seemed reactive to light, suggesting that light might be a useful treatment. Since then there has been considerable discussion about the condition, its validity and the value of different types of light. As with other 'modern' diseases like Royal Free disease (McEvedy & Beard, 1970) and Twentieth Century disease (Stewart & Raskin, 1985, 1986) there have been arguments about the class and aetiology of the condition. Of especial concern has been the rapid popularization of the light theory of depression and the rush to treat with light therapy.

It seems reasonable to suppose that if a condition like 'Seasonal Affective Disorder' commonly exists, it might have been commented on historically and in the epidemiology literature.

## HISTORY, SEASON AND AFFECTIVE ILLNESS

Available literature suggests that historical comments on seasonality have been generally sporadic, and are infrequent in history books of psychiatry. The patchy impression is that season and mental illness may be related.

In 2700BC., Wong T'ai (cited by McCartney, 1962) wrote a thesis which touched on the variation of diseases according to season. Hippocrates is quoted by Zilboorg (1941) as saying 'seasonal climatic conditions are of some importance; manias, melancholias and epileptic disorders he thought of as diseases of the spring'. Roman physicians, such as Aretaeus (transl. 1856), observed that 'melancholy is the commencement and part of mania' and that 'summer and autumn are the parts of the year most favourable for the production of this disorder, but it may occur in the spring' and Celsus (transl. 1838) thought that melancholy, madness and epilepsy were at their peak in spring, and that heat enervated the mind.

Kevan (1971) has compiled more recent statements. In the 17th century Congreve attributed the 'saturnine, dull and melancholic' disposition of the English, to the uncertainty of the English weather. Burton (1651) in *The Anatomy of Melancholy* said 'as the air is, so are the inhabitants, dull, heavy, witty, subtle (sic), neat, cleanly, clownish, sick and sound'; also, winter weather which is 'ugly, foul and squalid . . . works on all men more or less, but especially on such as are melancholic, or inclined to it . . .'.

Forster (1817), who incidentally coined the word phrenology, drew attention to three observations which had been little regarded: that insanity symptoms show diurnal variation, that each illness has a course, and that in certain cases insanity recurs at nearly the same time of year for several succeeding years. His contemporary Esquirol (cited in Goshen, 1967), from his study of all admissions to the Salpêtrière Hospital over nine years, deduced that admissions were highest from May to August, less in September to December and least in February and March.

More recently Kraines (1957) cited Huntington (1945) to the effect that insanity, suicide and sexual crimes in temperate climates are greatest in May and June. From Kraines' US study of his own manic-depressive patients, between 1933 and 1952, there were 702 attacks (not admissions), which tended to occur in March and September. He cited corroborative evidence from Leuthold's (1940) series from Germany for 385 attacks between 1930 and 1935, which tended to occur in

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March and October. While the main peak was October, for females, the overall attacks were more frequent in the spring. In another German study, Slater (1938) examined the records of 116 cases of manic-depressive illness diagnosed by Kraepelin. He found that hospital admissions peaked in May and to a lesser extent in September. Another personal series, that of McCartney (1962), was of 5678 'neuropsychiatric' cases recorded between 1946 and 1960 in the US. These *referrals* increased in March, April and May and decreased in June, July and August. Men peaked in the spring and women in the winter. Those patients who were 20 to 40 years of age peaked in the autumn and those under 20 peaked in the spring. Anxiety states peaked in the spring and autumn, while depressive reactions and manic-depressive reactions increased in autumn and decreased in the spring.

A general effect was reported by Stocks (1949), from a survey of sickness in the United Kingdom, from 1944 to 1947. He found all morbidity rates to be higher from December to March than from March to June. Prevalence rates for all diseases combined were highest in November and February. Males were reported to be more sensitive to season than females. Specifically, 'nervous complaints' showed a gradient from highest in autumn to lowest in the summer, but *incapacity* from these complaints was highest in March and October. Conversely, Smiley *et al.* (1954) found that insurance claims for 'mental illness' peaked in January.

Finally, a brief historical note on suicide. Durkheim (1897) said that without reference to his 19th century European data, it could be presumed that suicide would occur 'when the sky is the darkest and the temperature lowest' but his statistics showed that suicide peaked during 'the fine season when nature is smiling and the temperature mildest'.

## CONTEMPORARY RESEARCH

In the past quarter century attention to methodology and better statistics have improved understanding of the relationship between season and suicide, and season and mental illness. The findings are correlational rather than causal but lay down some interesting patterns. The studies fall into such categories as descriptive epidemiology (cross-sectional), case studies and prospective studies. The majority are descriptive. The following studies are given in chronological order. The suicide papers often include mental illness data.

### (a) Suicide and season

Some consensual validation of the relationship between season and affective disorder is given by studying suicide and season, since Barraclough *et al.* (1974) have shown that depression accounts for about 70% of suicides. The following studies indicate that suicide is largely related to spring and autumn; moreover, this seems to occur in different latitudes and continents. By examining suicide statistics over the past hundred years, Aschoff (1981) confirmed that suicide generally peaks in May or June, but in the past century the amplitude has decreased by 25%. He argues that there are definite seasonal rhythms for suicide, but that there has been either a reduction in environmental factors, or response to them. He suggests that this could be the result of industrialization or change in standard of living. Takahashi (1964) examined suicide data for 16 countries collected by the World Health Organization. In 15 Northern Hemisphere countries suicide peaked between March and July. Most countries had the highest rates from April to June and lowest from December to January.

Lester (1971) found peaks in May and October in New York State. Sanborn & Sanborn (1978) repeated Lester's study in New Hampshire over a longer period (1965–75) and found spring and autumn trends, without a sex difference. Cerbus (1970) showed, over five years in Ohio (1962–7), that suicide was significantly higher in May while homicide was not seasonal. Concurrently, mental hospital admissions in general were highest in March and lowest in December and February. The author argued that climatic rather than social or economic fluctuations influenced the psychiatric admission rate. Zung & Green (1974) examined psychiatric admissions to a veterans' hospital and suicide rates in North Carolina but failed to show any significant seasonal variation. Admissions for depression tended to be higher in March and April, and suicides were higher in May.

Eastwood & Peacocke (1976), in Ontario, found significant peaks for male suicides in May and October with trends for female suicides in March and October. Concurrently, hospital admissions for psychotic depression peaked in the spring, and neurotic depression in the autumn. Grouping all depressions revealed a bimodal distribution, with autumn having the highest rate. Other neuroses and schizophrenia did not peak. In Greece, Bazas *et al.* (1979) found that suicide in the years, 1959–1963 and 1969–1973 had a regular peak in June.

Meares *et al.* (1981) pointed out that, while the classical work by Durkheim (1897) had shown that in 19th century Europe suicide peaked in June and dropped in December, this pattern appeared to be changing. They examined suicide rates in England and Wales for the years 1958–1974. For males, there was a peak incidence in April/May and for females there were peaks in March/April and October/November. The authors believed that both biological and sociological factors were explicable. An important contrasting paper by Parker & Walter (1982), from New South Wales, examined suicide rates and admissions for manic-depression and depression. Peak admissions for manic-depression (manic type) and reactive depression occurred in or around the southern hemisphere spring while manic-depression (depressed type) peaked in late winter. Only female suicides showed seasonality, with the most frequent occurrences in May and November.

Nayha (1982) studied seasonal variation in suicide in Finland between 1961 and 1976. This was of special interest since that country has marked annual variations in luminance, a feature which Parker & Walter thought deserved further study. Using a period regression method, he found that male suicide peaked in May, and female suicide peaked in June and October. The autumn peak was also seen in young people (15–24 years), in the lowest (mainly students) and highest social classes and in *modern* occupations (e.g. technical, administrative and clerical). A spring-summer peak appeared in those with more traditional jobs (e.g. agriculture).

## (b) Mental illness and season

A variety of studies have specifically addressed the relationship between mental illness and season, although, regrettably, most major epidemiological studies have not been analyzed in seasonal terms.

### *i. Case studies*

Milstein *et al.* (1976) in Indiana found that 56 ‘carefully diagnosed’ manic-depressives were admitted to hospital significantly more often in the winter and spring and less in summer and autumn. Rihmer (1980) in Hungary examined females admitted to hospital with a bipolar illness over five and a half years (1972–77); he found that mania was more frequent in spring and autumn and depression in summer and winter, in 92 patients. There was a difference between bipolar I (hospitalized at least once for mania and possibly for depression) and bipolar II (hospitalized for only depression with no history of hospitalized hypomania). A six-month periodicity seemed to exist in bipolar I patients (spring – mania, summer – depression, autumn – mania, winter – depression), whereas a one year periodicity occurred in bipolar II (gradual decrease of depressive episodes from spring to winter).

### *ii. Descriptive epidemiology (general practice)*

Kellner (1966) obtained information on patient contacts with general practitioners. He concluded that ‘neurotic illness’ did not have obvious seasonal variation, although contacts were somewhat higher in spring and autumn. Nevertheless, a recent general practice study using prescriptions and consultation patterns for England (Harris, 1986), showed a clear spring peak between March and May, whereas the autumn peak was said to be equivocal. Harris suggests that the pattern of mild depression, seen in general practice, resembles that for major depression, seen in hospital, and for suicide.

### iii. Descriptive epidemiology (hospital admissions)

Abe (1963) in Japan correlated hospital admissions with latitude, and found a spring peak for admissions, particularly manic depressive disorder, which was earlier in lower (more southerly) latitudes. Angst *et al.* (1968) showed that manic-depressive illness and endogenous depression presented in spring and autumn in a variety of clinical settings in German speaking countries, whereas involuntional melancholia and schizoaffective disorder presented solely in the spring. Symonds & Williams (1976) examined hospital admissions between 1970 and 1973, inclusive, in England and Wales and found an August and September peak for mania in females but not for males. However, Walter (1977) re-examined their data and found a similar peak for males. Using the data for both sexes there was a significantly higher than expected number of cases in the months from May to October. Myers & Davies (1978) looked at the seasonal incidence of mania for eight years, in England and Wales, and eleven years, in Scotland, and found a peak in admissions in summer and a trough in winter.

Faust & Sarreither (1975), based on experience in Basel from 1956–79, suggested that schizophrenics and certain depressives were admitted in the 'warm' period; this was not true of neurotic states. Similar findings were made elsewhere, (James & Griffin, 1968; Steward & Wildman, 1968; Varma & Mujtaba, 1971), i.e. overall hospital admissions peaked in the 'warm' season.

Eastwood & Stiasny (1978) examined admission data to all Ontario psychiatric facilities for six years (1969–74 inclusive) and found that endogenous depression and alcoholism showed a significant peak in the spring, and neurotic depression in the autumn. Younger persons with neurotic depression, and those with personality disorders and drug addictions, were admitted significantly more frequently in the autumn. Schizoaffective disorder and mania did not show seasonal variation. Hare & Walter (1978), using hospital admission statistics in England and Wales from 1970 to 1973, found schizophrenia and mania to peak in July and August, while endogenous depression showed a less pronounced peak in June and July. Neuroses, including neurotic depression, had nonsignificant peaks in May, June, July and October.

Frangos *et al.* (1980) examined admission data for 51 years at the state hospital of Athens. Five hundred and thirty-three cases with episodic affective disorders (ICD 296.5, 296.1 and 296.0), were selected. Using a curve-fitting regression method, it was found that all forms of affective disorder had a maximum occurrence in May and a minimum in November, except for bipolar affective disorder – manic type, which occurred least often in January. Both depressive and manic episodes showed significant elevation in the spring.

## COMMENT

The investigations on mental illness vary considerably in precision, sample size, period of study and location. All are included for the sake of completeness. Clearly, any of these approaches to studying seasonality may be problematical. Thus, in suicide studies most, but not all, individuals suffer from depression; hospital admission data are influenced by nosocomial factors; case studies are retrospective; and general practice studies have to deal with uncertainty of diagnosis and prescribing habits. What matters in assessing this literature is whether there is agreement between studies of different size, type and worth, thereby conferring some consensual validity. In the 'large' studies, either in terms of numbers for the hospital admission or general practice studies or of time and place, as in lengthy case studies from different locations, there are findings in common (even though there is often more than one seasonal peak per study) and sensible inferences can be made.

The studies are categorized by season. Generally, the term 'season' has been used descriptively to mean quarter years (e.g. January, February, March as winter) or, more precisely, time between solstice and equinox.

### Winter

In the winter group there were two case studies and a hospital admission study from three countries. These studies consist of fifty-six 'carefully diagnosed' manic-depressives (of unknown phase) who had a tendency to fall ill more often in winter and spring than in summer and autumn; fifty bipolar I patients who oscillated quarterly between mania and depression; and 6159 manic-depressive – depressed type patients who had a peak one month before spring.

### Spring

In the spring group there were two case studies, six hospital admission studies and one general practice study from seven different countries. Terminology differed by study and phase of manic-depressive disorder is not always stated, but grouping endogenous depression, involuntional melancholia, depressive psychosis and bipolar II depression into one category (major depressive disorder) gave the following spring illnesses: manic-depressive illness (2), major depressive disorder (7), minor depressive disorder (2), schizoaffective (1), mania (3) and alcoholism (1). Of the fifteen peaks, twelve were of an affective nature and it has been argued elsewhere that, additionally, alcoholism may represent underlying depression (Eastwood & Stiasny, 1978). Furthermore, in Hare & Walter's study (1978) the endogenous depressions peaked across the spring/summer boundary.

### Summer

The summer group consisted of six studies from three countries. There were five admission studies (one a reworking of another study) and one case study. Mania peaked in three studies, schizophrenia in two studies and depression, variously called periodic depression, involuntional depression and bipolar I depression, in two studies. The large national studies came up with mania or schizophrenia peaks.

### Autumn

The autumn group consisted of four studies from four countries. There were three admission studies and one case study. Neurotic depression or neurotic depression along with personality disorders and drug addictions peaked in two studies; and manic-depressive illness, mania and endogenous depression in two others.

In summary, we have included fifteen recent studies of seasonality and mental illness. No two studies are alike; yet, from this pot pourri, some trends are evident. Firstly, mental hospital admissions are not uniform across the year, although all mental illnesses can occur at any time of the year. Secondly most studies show that affective disorders tend to peak in the spring and summer, major depression predominantly in spring and mania in spring and summer. The schizophrenia peaks in summer do not seem usual and may indicate the diagnostic confusion between mania and schizophrenia. Thirdly, winter peaks for any mental illness seem unusual and are not seen in any large-scale study (except marginally in Parker & Walter's in Australia). Fourthly, two large studies show peaks for neurotic depression and personality disorder in the autumn. The single general practice study, in contrast, places the peak for neurotic depression in the spring.

The suicide studies offer some support for the bimodal effects for affective disorder. Of the ten studies, nine show a spring peak, six an autumn peak and one no peak. There are sex differences and the most recent studies from Britain, Australia and Finland suggest that males only show a spring effect while women show a spring and autumn effect. Synthesizing the historical, suicide and mental illness studies allows these tentative conclusions: spring is associated with major affective disorder and the major peak for suicide, especially male; autumn is possibly associated with minor affective disorder and personality disorder (from the Canadian but not the comparable

Australian study, nor was this found in the English general practice study), and 'nervous complaint' and suicide, particularly female; mania is a spring and summer phenomenon. *An important point is that most of the mental illness and suicide studies had troughs in the winter.*

## SEASONAL AFFECTIVE DISORDER

Kraepelin (1921) asserted that annually occurring affective disorder is found only in 5% of patients with manic-depressive disorder. This has yet to be verified. Rosenthal *et al.* (1983a) reported on a patient with bipolar affective disorder who exhibited seasonal mood cycles and had kept a regular record of his mood and activity. These records showed that the patient's mood had annual mood cycles for seven years. The mood pattern was altered for several years but then returned to its usual form. During the years in which his mood cycles synchronized with season, he was hypomanic between spring and summer and depressed in the autumn and winter.

Rosenthal *et al.* (1984) coined the term 'Seasonal Affective Disorder' to describe a condition characterized by 'recurrent depressive episodes that occur annually'. A decrease in light was thought to precipitate the depression; therefore, it was felt that increasing the amount of light could be therapeutically beneficial. This notion was tested, using artificial light, on a patient who usually became depressed in the winter and hypomanic in the spring (Lewy *et al.* 1982). As the result was encouraging it was reported in a Washington DC newspaper. Readers purportedly suffering from seasonal mood changes were asked to volunteer for further research (Rosenthal *et al.* 1984). Volunteers were included if they met Research Diagnostic Criteria (RDC) for a major affective disorder; had depression which began in the autumn or winter and remitted in spring or summer for at least two consecutive years; and if they lived close enough to maintain adequate contact. From over 2000 respondents, 29 met the inclusion criteria and had a number of common clinical and demographic features. Most were female and the mean age was 36.5 years. Two-thirds reported a family history of affective disorder. Twenty-seven were diagnosed as bipolar affective disorder, and two as unipolar affective disorder. Two-thirds of the subjects had received past psychiatric treatment, although few had been hospitalized. This group was different from most cases of affective disorder in that the volunteers commonly reported weight gain, carbohydrate craving and hypersomnia when depressed. Many claimed that they improved in a more southerly latitude. During the winter in which the study took place 18 subjects became depressed of whom 11 received light therapy. The results were generally positive.

Subsequently the condition, styled 'Seasonal Affective Disorder', was redefined according to the criteria set out in the appeal for volunteers, without the location criterion and with no evidence of other psychiatric disorders or psychosocial stressors.

This definition appears to be circular. It was defined before it was found. Given the possible combinations of symptoms, demography and times of onset of psychiatric illness, its discovery was not surprising. Even so, the subclass of patients was not homogeneous. Onset of depression ranged from September to January and remission from January to May. Since light waxes and wanes between the solstices, the relationship between light and mood was not established in this study.

Another circular problem appears in examining treatment. Evidence of response to light appears to subsume the notion of Seasonal Affective Disorder. In other words, light should be an effective treatment because Seasonal Affective Disorder has a course which is supposedly due to changes in daily photoperiodism. Conversely, Seasonal Affective Disorder must exist because it has an effective treatment.

Meanwhile, recurring mood cycles have been found in those with and without affective disorders. Eastwood *et al.* (1985) studied prospectively infradian mood rhythms in 64 people, 30 bipolar affective disorders and 34 normal controls. Mood cycles occurred in 80% of subjects and in about a third of the subjects the cycles lasted for around 90 days (a quarter of a year or more). These existed in both cases and controls, which implies that mood is a continuously distributed variable with illness being a pathological variant. When the mood symptoms were analyzed as monthly averages, it appeared that (a) both cases and normal controls became dysphoric in the autumn but euphoric

at Christmas time and (b) controls became euphoric in the spring and cases dysphoric in the spring (Eastwood *et al.* in preparation). Thus, dysphoric mood may be common to many people in the autumn, and coincidentally occurs when the daily light is reducing but, even if these are related, it does not follow that there is a need for medical intervention.

## CONCLUSIONS

Epidemiological evidence suggests that major affective disorder – depressed type is commonly precipitated, as a class, and appears as a peak, largely in the spring, at different latitudes and in different continents. This is a pattern familiar to clinicians but *it does not necessarily mean that it happens, in successive years, for individuals*. Certain historical studies mention autumn effects, such as ‘nervous complaints’ and incapacity from ‘nervous complaints’; female suicide has a peak in autumn; and the Ontario studies show peaks at this time for neurotic depression, personality disorder and drug addiction.

The aetiology of these peaks may well be multi-variate since it is generally conceded that affective disorders are a composite of biological, social and psychological factors. Yet, while societal factors are complicated, they do not seem to change much annually in present day, mostly urban, society. Furthermore, psychological factors are not usually regular and widespread. Biological and climatic influences may therefore well be pertinent.

Seasonal Affective Disorder, said by Rosenthal *et al.* (1983*b*) to be an illness which starts regularly in the autumn or winter and remits in the spring and summer, is also said to be aborted by light. Thus, this condition has been made central to the photogenic theory of depression, upon which much of the argument about seasonality of affective disorder rests. Therefore, if Seasonal Affective Disorder is credible, then so is photoperiodism. Epidemiological research does not give credence to this argument, since spring peaks for major depression are much more common than those for autumn, and particularly winter. Furthermore, autumn peaks seem to occur in September or October, rather than closer to the winter solstice. Christiansen & Dowrick (1983) showed that in Alaska depression related services peak in the summer or autumn and contended that midwinter depression is a myth. The winter depression theory would be better upheld if there were a peak contiguous to the shortest day of the year, and a trough in the spring when the patients recovered. It has to be asked, therefore, why ‘Seasonal Affective Disorder’ has not been more conspicuous. Possible reasons are that it might be something new; it may be so mild as not to come to the attention of the medical profession (even those in family medicine); it might be uncommon; or it might be an unusual condition based on a self-selected sample.

Notwithstanding, the notion of Seasonal Affective Disorder is leading to a search for light therapy by depressed patients, with the risk that they might be misled. Patients with incurable or intractable disorders, especially if suggestible, will always pursue a chimera. By contrast, the evidence for seasonality of affective disorder is strong, and investigations might more profitably focus on spring and summer periods. It is imperative that weather variables and mood are properly correlated to substantiate climatic effects and, indeed, such a study is under way.

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