Seasonal variation in suicides: diminished or vanished
Experience from England and Wales, 1982–1996

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Background  Seasonal variation in suicidal death has been observed in many countries. In particular, a cyclic variation was found for both men and women in England and Wales in the 1960s and 1970s. Men showed a single 12-month cycle whereas women showed two cycles.

Aims  To re-examine the seasonal variation in suicides in England and Wales for the period 1982–1996.

Method  A harmonic analysis was used to detect the seasonality of the suicide data.

Results  The seasonal effect on suicide is greatly diminished in England and Wales. This is shown by the reduced amplitude and smaller proportion of variance accounted for by the season.

Conclusions  The seasonal effect on suicide has either diminished or vanished.

Declaration of interest  None.

Seasonal variation in deaths by suicide is an important study in terms of understanding the possible sociological and biological determinants of suicide and its prevention. Spring peaks for males and spring and autumn peaks for females were found in the UK (Barraclough & White, 1978; Meares et al, 1981), Australia (Eastwood & Peacocke, 1976; Parker & Walter, 1982), Finland (Nayha, 1982, 1983) and Italy (Miccioletti et al, 1989, 1991). A spring and late summer peak and a trough in winter months were found for suicides for both men and women in the USA (Lester, 1971; Lester & Frank, 1988). Massing & Angermeyer (1985) give a comprehensive account of the effects of season on suicides in the 1960s and 1970s. Recently, a harmonic analysis was applied to examine suicides in Australia and New Zealand. Only one cycle for both men and women was observed (Yip et al, 1998). A similar finding was also observed in Hong Kong and Taiwan (Ho et al, 1997). The present study attempts to examine seasonal effects on suicides in England and Wales with respect to gender, age group and method of suicide. We have two objectives: to verify the findings in Meares et al (1981) and Barraclough and White (1978) about the seasonal effect in England and Wales, i.e. men showed a single 12-month cycle, whereas women showed two cycles; and to investigate whether seasonal variation is found more strongly in some subgroups of the population (e.g. by age or method of suicide) than in others.

\[ A_i = a_0 + \sum_{i=1}^{90} \left( a_i \cos \frac{2\pi ij}{180} + b_i \sin \frac{2\pi ij}{180} \right) \]

where \( a_i \) and \( b_i \) are constant \( (j=1, \ldots, 90) \), \( a_0 \) is the mean suicide number and

\[ a_i \cos \frac{2\pi ij}{180} + b_i \sin \frac{2\pi ij}{180} \]

is commonly referred to as the \( j \)th harmonic of \( A \), with period \( 15/j \) years and frequency per annum \( j/15 \). The harmonics with \( j=15, 30, 45, 60, 75 \) and 90 have periods of 1, 1/2, 1/3, 1/4, 1/5 and 1/6 years and frequencies per annum of 1, 2, 3, 4, 5 and 6, respectively. For example, one such sinusoidal curve is that with a period of 6 months (1/2 year), which has just two peaks and two troughs in each year. These harmonics have a cycle that repeats an exact number of times per year and follows the same pattern in years as any combinations of such harmonics. The quantities \( a_i \) and \( b_i \) are estimated so as to give the best fit to the data, and they describe the amplitudes of the separate sinusoidal components. The significance of a particular METHOD

The Office for National Statistics (England & Wales) provided data for all deaths by suicide for the period 1982–1996. Information on age, gender, method and month of suicide was also made available. The data included here relate to cases where judicial inquiries established that the cause of death was suicide. They were coded in the range E950–E959 of ICD–10 (World Health Organization, 1992). The chosen period enabled comparison with results obtained in the 1960s and 1970s (Barraclough & White, 1978; Meares et al, 1981).

The seasonal variations in suicides were examined in three ways. First, the number of suicides in England and Wales for each month of the period 1982–1996 was plotted separately for each gender. Second, a daily mean suicide incidence and cumulative number of suicides were calculated for each month of the study period. Third, a harmonic time series model was applied to different genders, age groups and methods of suicide. The method of analysis was similar to that employed by Barraclough & White (1978), Miccioletti et al (1991), Ho et al (1997) and Yip et al (1998). In this model, the variation in suicides between the months is described as the sum of the sinusoidal curves. The seasonal variation consists of those components with cycles that repeat themselves an exact number of times per year. Let \( A_i \) be the number of suicides for month \( i \); for a period of 15 years (180 months),

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where \( a_i \) and \( b_i \) are constant \( (j=1, \ldots, 90) \), \( a_0 \) is the mean suicide number and

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seasonal variation, as well as to random and non-seasonal variation. Under the alternative hypothesis, that the variation is purely random, the monthly totals may be considered as independent identically distributed Poisson random variables. The details of testing the significance of the different components of the variation can be found in Pocock (1974), Barralouche & White (1978) and Yip et al (1998).

RESULTS

A total of 59,608 (43,229 males and 16,379 females) suicides were identified in England and Wales for the period 1982–1996. The age-specific suicide rates by gender for the study period were plotted and are shown in Fig. 1. A statistically significant decreasing trend was observed in the group (male and female) aged 60 years or over ($P < 0.05$). On the other hand, an increase in the suicide rate among males of age 15–24 years was noted ($P < 0.05$). Suicide rates increased with age among females, but not among males. Males aged 25–39 years have shown the highest rate since 1994. The monthly distribution of suicides, for males and females is shown in Fig. 2. The cumulative number of suicides for both males and females, and the monthly mean number of suicides per day are shown in Table 1 and Fig. 3, respectively. The assumption of even distribution of suicides was rejected ($P < 0.01$); December had a trough for both males and females.

Table 2 shows the results of harmonic analysis by gender. Only 15 and 17% of the total variations can be explained by the seasonal component for males and females, respectively. The effects of all seasonal harmonics are marginally statistically significant, with $P > 0.05$. In order to examine the possible determinant

Table 1  The observed and expected number of suicides by month and gender in England and Wales, 1982–1996

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<th>January</th>
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<tr>
<td>Observed</td>
<td>3755</td>
<td>3251</td>
<td>3777</td>
<td>3706</td>
<td>3717</td>
<td>3660</td>
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<td>3626</td>
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<td>3590</td>
<td>3605</td>
<td>3392</td>
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<tr>
<td>Expected$^1$</td>
<td>3669</td>
<td>3345</td>
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<td>$\chi^2$</td>
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<td>d.f.=11</td>
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<td>Observed</td>
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<td>Expected$^1$</td>
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<td>d.f.=11</td>
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1. The expected number of deaths has been adjusted by the number of days in a month.
significant reduction in the proportion of variance accounted for by season. We examined the possible confounding factors, such as age and method of suicide, and found nothing to be significant. Also, we included the undetermined causes of death (E980–989) in the analysis and similar results were obtained. Seasonal components were not significant.

**Reduction in seasonal fluctuation observed in other countries**

Similar findings using the same harmonic analysis were obtained in other countries: for example, Miccilo et al (1989) suggested that 48–65% of the variance in Italy’s suicide data in the 1970s was explained by seasonal components; in the 1980s and 1990s this figure was only 25–32% in Hong Kong and Taiwan (Ho et al, 1997), and 3–17% in Australia and New Zealand (Yip et al, 1998).

**Change of lifestyle**

Durkheim (1897) believed that seasonal variation in suicidal behaviour was determined by the intensity of communal life and activities. Technological development in telecommunications and the fact that people tend to be ‘connected’ more often than before (for example, by mobile phones, e-mail and the internet) and also the different activities and social contacts nowadays, all may play a part in determining the seasonal effect on suicide.

The exact impact of these changes on the seasonal variation in suicides is far from clear, but it is not surprising to see a reduction in the seasonal influence on the distribution of suicides.

In conclusion, the present study found that the seasonal effect on suicides in England and Wales is less obvious than previous studies suggested. The present finding challenges the existence of seasonal effects and predicts that seasonal variation in suicides will disappear in the new millennium.

**ACKNOWLEDGEMENTS**

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**REFERENCES**

CLINICAL IMPLICATIONS

Suicide risk was more uniformly distributed throughout the year before attempting suicide. Socio-cultural factors may play a more significant role in determining the seasonal effect in suicides.

The decrease in suicide rates in the high-risk groups of widowed and divorced is encouraging. It is important to understand the reasons for this decrease in order to be able to reduce the suicide rates further in England and Wales.

LIMITATIONS

We were unable to determine the biological effect (e.g., seasonality in suicide) on the reduction of seasonal variation in suicide.

The results would be more statistically powerful if a longer series of data were available. Although 15 years of data are quite sufficient, the effect of underreporting of suicide on the seasonal effect is yet to be determined.

REFERENCES