Title

Permalink
https://escholarship.org/uc/item/4b19v5f5

Journal
American Journal of Public Health, 81(11)

ISSN
1541-0048

Authors
McCleary, R
Chew, K S
Hellsten, J J
et al.

Publication Date
1991-11-01

Peer reviewed
Age- and Sex-Specific Cycles in United States Suicides, 1973 to 1985

Richard McCleary, PhD, Kenneth S. Y. Chew, PhD, James J. Hellsten, MS, and Marilyn Flynn-Bransford

**Introduction**

Analyzing 129,621 US suicides recorded during 1972 to 1978, MacMahon\(^1\) found that (1) within each year, suicides peak in late spring and drop in winter; (2) within each month, suicides peak on the fifth day and drop until month's end; and (3) within each week, suicides peak on Monday and drop to weekend lows. Although all three cycles were reported as early as the 19\(^{th}\) century,\(^2,3\) MacMahon confirmed their existence in a reliable data set. Even with a 7-year series (1972 to 1978, 2,557 days), unfortunately, analyses of aggregated suicides cannot answer questions of heterogeneity. Analyses of a longer 13-year series (1973 to 1985, 4,748 days) confirm MacMahon's basic finding of annual, monthly, and weekly cycles. But more significantly, subpopulation analyses reveal that the cycles vary by age and sex.

**Data and Method**

To avoid the temporal and geographic limitations of earlier studies,\(^4,5\) individual suicide data for 1973 to 1985 were obtained from a database compiled by the National Center for Health Statistics.\(^6\) Data from 1972 were excluded because they were a 50 percent sample. Otherwise, our data are identical to those analyzed by MacMahon.

Although the magnitude of a time series cycle can be expressed in many ways, the simplest index is the PRE (proportionate reduction in error) statistic for the periodic means. To define this index, let \( \bar{S} \) be the mean number of suicides for all (4,748) days and let \( \bar{D}_j \) and \( \bar{M}_k \) be the mean number of suicides on the \( j \)th weekday, \( k \)th date, and \( j \)th month. Then for weekdays, dates, and months

\[
\text{PRE} = 1 - \frac{\sum_i \sum_j (S_i - \bar{D}_j)^2 / \bar{D}_j}{(S_i - \bar{S})^2},
\]

\( j = 1 \)st to 31st

\[
4748 \quad 31
\]

\[
\text{PRE} = 1 - \frac{\sum_i \sum_k (S_i - \bar{M}_k)^2 / \bar{M}_k}{(S_i - \bar{S})^2},
\]

\( k = \) January to December

PRE varies between 0 and 1 and is interpreted as the proportion of variance in daily suicides attributable to weekdays, dates, or months.

**Results**

Table 1 breaks down US suicides by day of the week, date, and month. This longer series confirms MacMahon’s finding of weekly, monthly, and annual cycles. We proceed first to disaggregate total periodicity by age and sex and then to disaggregate each of the three cycles—weekly, monthly, and annual—by age and sex.

Table 2 reports PREs for day of the week, date, and month estimated for 15 age groups. Under a null hypothesis, PREs follow an \( F \)-distribution with degrees of freedom equal to the series length \( (n_1 = 4748) \) and the number of periods \( (n_2 = 7 \) days of the week, 31 dates, or 12 months). Null hypothesis probabilities are listed beside each PRE in parentheses. With .01 significance, many of the PREs are due to chance. The PREs are graphed...
in Figures 1a through 1d to highlight some striking patterns of significance.

**Total Periodicity**

Considering all three cycles jointly (Figure 1a), periodicity is more pronounced for male than female suicide. Males younger than 25 and older than 45 appear most affected. Although PREs for females rise between ages 50 and 70, the effect is more striking among males.

**Day of the Week**

This cycle plays no significant role in either male or female suicides until middle age (Figure 1b). For men, the effect builds dramatically from age 41 to age 55 and then, from age 56 to age 65, drops just as dramatically. For women, the effect is less pronounced but evident nonetheless.

**Date of the Month**

This cycle is insignificant for males and females until old age (Figure 1c). For males, the effect appears first at age 60 and increases in size until it stabilizes at age 70. For females, the effect occurs only between ages 60 and 70 and, compared to the male effect, is relatively small.

**Month of the Year**

For women, this cycle is insignificant (Figure 1d). For males, the cycle is limited principally to teenage and elderly suicides. Although both young and elderly male suicides are subject to annual periodicity, the two cyclical patterns are radically different. Figure 2 plots the standardized mean suicides for males under 16 and over 80 years of age. For the younger group, suicides peak in winter and fall to lows in summer. By contrast, suicide among the very old is low in the winter but rises as summer approaches.

**Discussion**

This investigation used an extended time series (1973 to 1985) to describe the age- and sex-specific periodicity of suicides in the United States. The analysis shows wide variation in the periodicity of suicide rates across ages and between the sexes. First, the analysis not only confirms that periodicity affects primarily male suicide, but also suggests that its effects are most pronounced for males under age 20 and over age 40. Second, concerning the weekly cycle, the analysis goes beyond existing literature in suggesting that the Monday peak holds mainly for men aged about 40 to 65. Third, it reveals that the monthly cycle observed by Mac-
some individuals—or perhaps, for all individuals at particular stages of the life cycle—is the risk of suicide distributed nonrandomly. Nonetheless, the complex distribution of periodicity suggests that age- and gender-linked contingencies are involved in suicide and that gender and life cycle should be considered in attempting to understand this phenomenon.

References


7. Zung WK, Green, RL. Seasonal variation of suicide and depression. *Arch Gen Psychiatry.* 1974;30:89-91.


Figure 1—Proportionate reduction in error (PRE).

a—Total periodicity
b—Day of the week only
c—Date of month only
d—Month of the year

Figure 2—Suicides by month for males under 16 and over 80 years of age.