# Intra-monthly Distribution of Suicides in Denmark 1970-1998.

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**Objective**
Short-term temporal fluctuations in suicide rates have been observed in many countries. Most familiar are seasonal (or monthly) and weekly fluctuations. The Danish data on suicides 1970-1994 show a distinct peak in spring (March to May) and a peak on Mondays with a steady decline through the week and with the lowest mean on Saturdays [1].

Several studies have demonstrated a decline in frequency of suicides before and during public holidays and a rise shortly after [2]. The Danish data on suicides 1970-1994 show a postponement of suicides from before and during a holiday until after, particularly Christmas, Easter and Whitsun [1].

Variation in frequency of suicides by day of the month (intra-monthly distribution) was first reported by MacMahon [3]. Suicides were most frequent around the $5^{th}$ of the month and least frequent in the last days of the month, and she speculates in explanations of cycles related to cycles in personal finances.

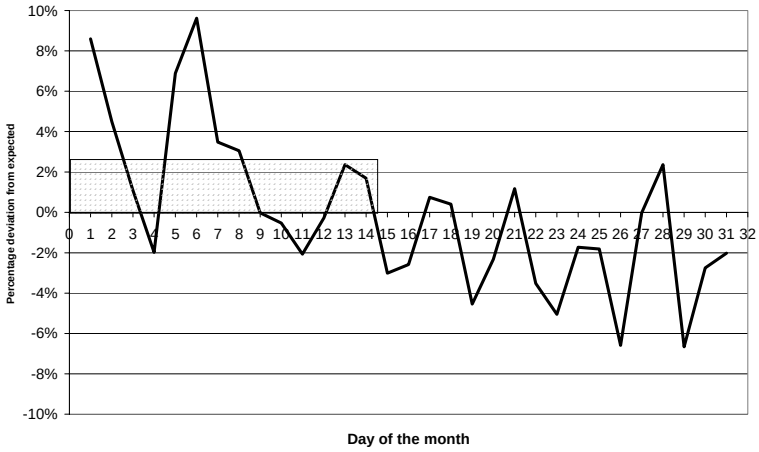
The aim of the present study was to investigate the intra-monthly distribution of suicides in Denmark between 1970 and 1998 and examine whether major holidays exert any direct influence on the distribution

**Methods**
Danish data on suicidal deaths 1970-1998 (n = 35.680) were analysed statistically on a daily basis. Monthly or intra-monthly distribution of suicides was tested by a $\chi^2$-test, taking variation in length of the month into consideration. Day to day analyses of fluctuation were tested assuming the number of suicides follows a Poisson distribution.

**Results**

The intra-monthly fluctuation of suicides was significant ($\chi^2$-test for equal distribution over 31 days of the month, $p < 0.005$) and exhibited two distinct patterns: peaks at the 1st day of the month and around the 5th, 6th, and 7th day of the month, and a steady decline during the month (figure 1).

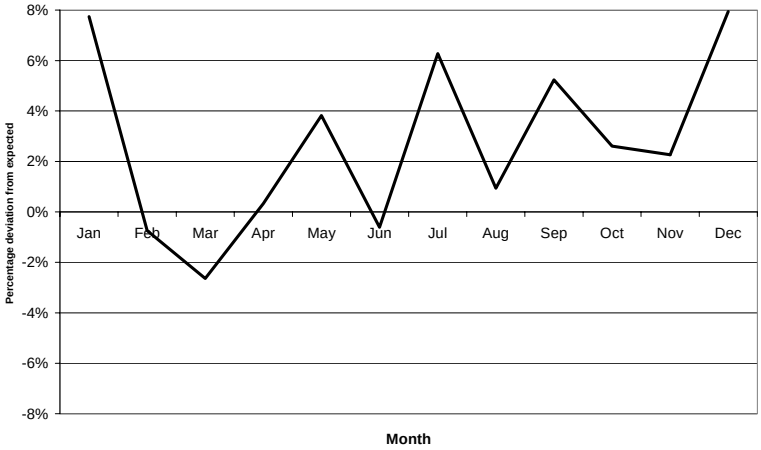
Figure 1. Intra-monthly fluctuation of suicides in January-December. Percentage deviation from expected.




Another way of presenting intra-monthly data is aggregation into two periods. This allows studying the steady decline throughout the month. The observed number of suicides on the first 14 days in each month was compared to the expected number, assuming an equal distribution of suicides throughout the month. A general pattern of increased suicide rates was found in the first half of the month, showing 2.6 % more suicides than expected ($p < 0.00001$). The excess of suicides in the first part of the months is illustrated by a grey box in figure 1.

This pattern was not universal, however (i.e. apparent throughout the year, Figure 2), but was particularly marked in December (Figure 3, an excess of 7.9 % suicides, $p < 0.0005$) and January (Figure 4, an excess of 7.7 % suicides, $p < 0.0005$). Other significant months with an elevated frequency of suicides in the beginning of the month was July (an excess of 6.3 %, $p < 0.005$) September (an excess of 5.2 %, p= =0.01) and May (an excess of 3.8 %, $p < 0.05$) (Figure 2).

Figure 2. Intra-monthly distribution of suicides by month. Percentage deviation from expected (corrected for monthly distribution).




The interpretation of increased suicide rates in the beginning of December and January as an effect of Christmas and New Year was strengthened by a day-by-day analysis of the period from December 15$^{th}$ to January 14$^{th}$. This showed very clearly that there is a major decrease in suicide risk from December 15$^{th}$ to December 31$^{st}$ ($p<0.05$, one-tailed for Dec. 23$^{rd}$ to Dec. 26$^{th}$) compared to the first part of the month. Additionally, there was a major increase in suicide risk from January 1st to January the 14th ($p<0.05$, one-tailed for January 1$^{st}$ to January 3$^{rd}$ and January 6$^{th}$ to January 8$^{th}$). This may indicate that the peak - as seen in figure 1- in the first half of the month is, at least in part, attributable to the effects of Christmas and New Year.

Exclusion of December and January from intra-monthly distribution of suicides is illustrated in figure 5. The excess of suicides in the beginning of the month is only 1.6 % ($p = 0.01$).

Figure 3. Intra-monthly fluctuation of suicides in December. Percentage deviation from expected.

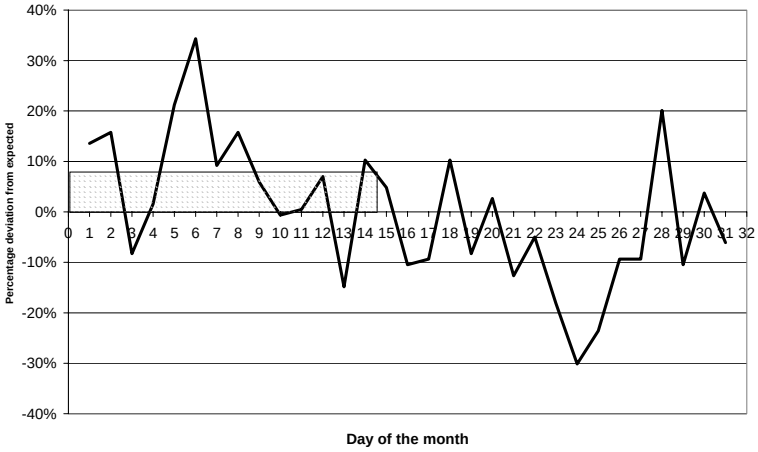



Figure 4. Intra-monthly fluctuation of suicides in January. Percentage deviation from expected.

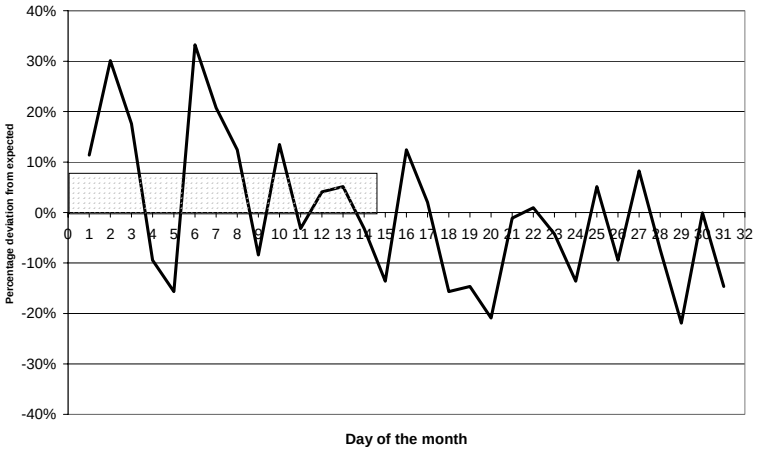
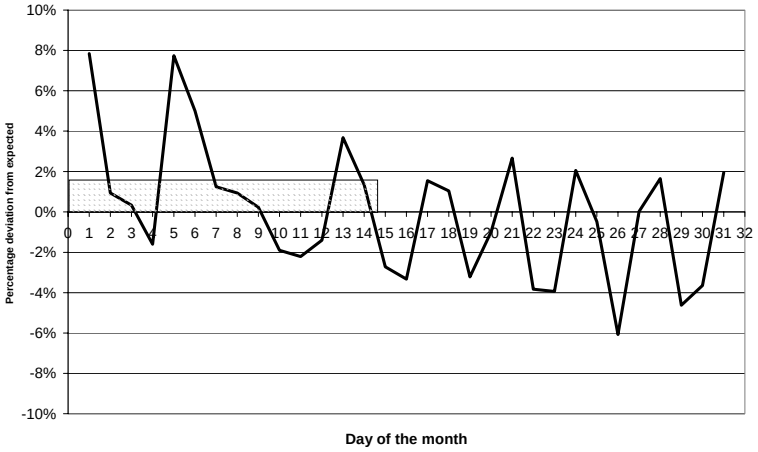


Figure 5. Intra-monthly fluctuation of suicides in February-December. Percentage deviation from expected.




## Discussion

Especially Christmas appears to possess a prophylactic effect in regard to suicide. The impact of Christmas on Christian societies is an apparent reduction in the suicide rate a few days before and during the Christmas holidays. An obvious sociological explanation for the December nadir is that the increased level of emotional and social support this time a year may act as a buffer in regard to suicidal behaviour. This protective effect persists for several days after Christmas. If December and January are excluded from the intra-monthly distribution of suicides, the pattern is less marked.

The identification of rhythmic patterns in suicidal behaviour may have implications for the understanding of the aetiology of suicide and for the planning and staffing of support services.

## References

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2. Phillips DP, Liu J. The frequency of suicides around major public holidays: some surprising findings. Suicide Life Threat Behav. 1980 Spring;10(1):41-50.
3. MacMahon K. Short-term temporal cycles in the frequency of suicide, United States, 1972-1978. Am J Epidemiol. 1983 Jun;117(6):744-50.