

This is a pre-copyedited, author-produced PDF of an article accepted for publication in [insert journal title] following peer review. The version of record Plöderl, M., Fartacek, C., Kunrath, S., Pichler, E. M., Fartacek, R., Datz, C., & Niederseer, D. (2014). Nothing like Christmas—suicides during Christmas and other holidays in Austria. The European Journal of Public Health, cku169 is available online at: <http://dx.doi.org/10.1093/eurpub/cku169>

Nothing like Christmas – Suicides during Christmas and other Holidays in Austria

Martin Plöderl,^{1,2,3} Clemens Fartacek,^{1,2,3} Sabine Kunrath,^{1,2,3} Eva-Maria Pichler,^{1,2} Reinhold Fartacek,^{1,2}
Christian Datz⁴, David Niederseer⁴

¹Suicide Prevention Research Program, Paracelsus Private Medical University, Salzburg, Austria

²Dept. of Suicide Prevention, University Clinic of Psychiatry and Psychotherapy I, Christian Doppler Clinic, Salzburg, Austria

³University Institute of Clinical Psychology, Christian Doppler Clinic, Salzburg, Austria

⁴General Hospital Oberndorf, Teaching Hospital of the Paracelsus Medical University, Department of Internal Medicine, Paracelsustr. 37, 5110 Oberndorf, Austria

Corresponding Author:
Martin Plöderl
Sonderauftrag für Suizidprävention
Christian-Doppler-Klinik
Ignaz-Harrer Str. 79
5020 Salzburg, Austria
e-mail: m.ploederl@salk.at
Tel: +43-662-4483-56679
Fax: +43-662-4483-4344

Abstract

Background:

Contrary to the myth that suicides increase around Christmas, multiple studies reveal that suicide rates decrease towards Christmas and return back to normal or even peak in the beginning of the new year. We aimed to replicate this effect for Austria.

Methods:

The analyses were based on the official suicide statistics 2000 – 2013 using Poission regression and Bayesian changepoint analysis. We also investigated changes of suicide rates during other major holidays and weekends. Seasonal effects were controlled for by using restricted control periods.

Results:

Suicide rates declined before Christmas and were minimal on December 24th, remained low until the end of the year, peaked on New Year's Day, but remained at average level in New Year's week. In contrast, suicide rates increased in the week after Easter and on Mondays/Tuesdays after weekends. No significant effects were found in the week after Whitsun and summer holidays.

Conclusion:

Compared to other holidays, Christmas time is clearly associated with fewer suicides in Austria, too, and may even counteract the "broken promise" effect. This finding may help clarifying common myths in suicide prevention and may enhance the proper timing of preventive efforts.

Keywords: suicide; Christmas; holidays

Introduction

It is a common myth that the incidences of suicide peak at Christmas, but several studies found lower than average suicides and also suicide attempt rates during Christmas (1-5). Furthermore, suicide attempts, psychiatric admissions, and crisis calls seem to decline, too (5-8). In these studies, increased connectedness and social support are discussed to be the main protective factors involved in the decline of suicides around Christmas. In the beginning of the year, there is a spike of suicides and then the suicide rate normalizes (1, 3, 4). This is in line with a so called “broken promise” effect (9): “spring, weekends, and holidays are examples of affectively positive events with the potential to promise more than they can deliver (p. 138)”, resulting in an increased suicide risk at the end of the holidays.

In this paper, we try to replicate the findings for Austria for several reasons: First, it cannot be taken for granted that the protective effect of Christmas occurs in all countries and cultures. For example, increased suicide rates at Christmas were reported in countries with different predominant religions, such as Romania and Turkey, where no decrease of suicides occurred in December (10, 11). Second, replication in different research settings is vital in science (12). Third, statistical analysis only available recently such as Bayesian changepoint analysis can reveal points where the properties of time-series are changing. In addition, we also planned to analyze the association of other holidays and weekends with suicide rates in order to compare it with the Christmas effect.

Methods

Data and data preparation

The number of daily suicides between 2000 and 2013 were obtained from Statistik Austria who administers the official death statistics.. For each day, the mean number of suicides was calculated, a procedure that is common for the research question at hand (1, 3). We removed the 29th of February in the years 2000, 2004, 2008, and 2012 to achieve yearly time series of identical lengths.

For the Christmas hypothesis, we rearranged the time series so that the first data point corresponded to the mean number of suicides on July 1st and the last data point to June 30th (Fig. 1). This

was necessary because suicides are known to peak on New Year and changepoint analysis cannot be done if the changepoint occurs at the very end of a time series. For the Poisson regressions and for descriptive data, the Christmas period was defined as lasting from December 24th to 31st. In Austria, December 24th is traditionally the day with the most important activities (family meetings, church attendance, lighting of the Christmas tree, giving presents etc). December 25th and 26th are national holidays. Many companies close between December 24th and New Year. Schools are closed from December 24th to January 6th. We also used the week before Christmas (Dec. 17th - 23rd) and the first weeks of the new year (January 1st - 7th) as additional categories in the analysis. The 30 days before advent (November 01-30) and the 30 days after New-Years week (January 08 – February 20) were used as control period. In a previous version of this paper we used the rest of the year as control period, but as a reviewer pointed out, seasonal variations of suicide rates may then bias the results, thus we restricted the control period.

As regards to the other holidays, we used the week before and afterwards as additional category and the 30 days before and after the week around the holidays as control period. Easter Monday and Whitsun Monday are national holidays with a variable date. Schools are closed on the Tuesdays following these two holidays. The school's summer break typically starts in July and lasts for 9 weeks, with a staggered begin in about half of the Austrian provinces. People typically take their major vacation within that time. To explore the suicide rates during Easter, Whitsun, summer break, and the weekends, individual time series were created for each holiday. For each such time series, it was necessary to shift the time series 2000-2013 so that the holidays or the weekends corresponded for each year. Regarding the summer break, we used either the period where any (summer 1) or all (summer 2) of the provinces were on break. Weekend was defined as Saturday and Sunday, with Wednesday to Friday as control period before weekend and Monday to Tuesday as period afterwards.

Data analysis

The means and standard deviations of daily suicides were calculated for the periods defined above. In the Poisson regressions, a control period of 60 days, i.e., the 30 days before and after the week around the holidays, was used as the reference category. Bayesian changepoint analysis was realized with

R's bcp package (13). Such changepoint analysis can uncover changes in the parameters that generate the time-series (e.g., marked upswings/downswings, breaks, steps). In a frequentist approach, such changepoints are indicated with a decision rule ($p < .05$), with the known problems associated with significance testing. Bayesian changepoint analysis has the advantage that it calculates a posterior probability distribution for the occurrence of a changepoint across all time points, thus going beyond problematic yes/no decisions as in classic statistics. The procedure that we used also is described as being superior to alternatives (13). All data analysis were carried out with R 3.0.2 (14).

Results

Christmas

The average daily suicide rate throughout the year was $M = 3.73$ (Range: 2.14 – 5.57). Suicide rates declined towards Christmas and remained low until the end of the year, followed by spike on New Year's Day and an immediate fall back into the average level (Fig. 1). On December 24th, there mean daily suicide of 2.14 was close to the yearly minimum. The mean daily number of suicides during the Christmas period was 2.6 compared to 3.4 during the control period (Table 1). Results from regression analysis indicate that suicide rates were significantly reduced during Christmas week (December 24th - 31th) and also the week before (December 17th - 23th), compared to the control period, corresponding to a reduction of suicides of 25% and 22%, respectively (Table 2). There was no significant increase of suicides in the first week of the new year. The results remained the same after controlling for the day of the week as a possible confounding variable in a multivariate regression model (results not shown here). There were significantly fewer suicides in the control period compared to the rest of the year, indicating that suicides are generally lower in winter than the rest of the year.

The Bayesian changepoint analysis corroborates the changepoint at end of the year which is obviously visible in Figure 1 [posterior probability (PP) = 0.82], i.e., the probability of a changepoint at this location is 0.82, given the available data]. Before Christmas, the rates seem to decline continuously, with a peak of PP = .33. at December 15th, indicating that at this date, the rates may decrease stronger.

Other Holidays

Before New Year's Day, there was a significant decrease of suicides, but no increase in the week following New Year's day. However, on New Year's Day, suicide rates were significantly elevated, being close to the yearly maximum. No significant decrease of suicides occurred during Easter, Whitsun, summer break, or the weekends, although the effect of whitsun was close to being significant (Table 2). There were significantly more suicides in the week after Easter and on Mondays and Tuesdays. Of note, suicide rates were generally increased around Whitsun and Easter and decreased around the summer-break, indicated by a significant difference between the control periods and the rest of the year. For the summer break, the results of the regression analysis were comparable for the two different time-periods. Change-point analysis did not reveal any notable results.

Discussion

Similar to other studies, there was a decline of suicide rates in the Christmas week in Austria, too, corresponding to 25% less suicides, compared to the control period. Suicide rates peak on New Year's day and sharply go back to the average levels of suicides as indicated by the occurrence of a breakpoint in the time-series. In contrast to other studies (1, 3, 5), there was no above-average upswing of suicides in the beginning of the new year. Such an upswing is often explained with the broken promise effect. The lack of such a rebound effect in Austria deserves further study. Nonetheless, the sharp disappearance of the lowered suicide rate around Christmas is worth closer inspection. In one study, this rebound effect was stronger among men than among women (1). The proposed mechanisms involved in the rebound effect in New Year are, for example, reduced social support, alcohol consumption, or unmet expectation and associated changes of perceptions of the future (1, 4-6, 9). Furthermore, New Year is usually associated with an outlook to the future, which may increase or reactivate hopelessness among people at risk (9), or may lead to a reevaluated balancing of reasons for living and reasons for dying. New Year seems to be exceptional because it most explicitly marks a transition between an old period and a new one, is associated with collective optimism (thus leading to marked contrast with the inner world of people at risk for suicide) and most people stay up late, enabling extended periods of rumination (9). Perhaps one or more of such mechanisms are different in Austria than compared to other countries.

Continuous monitoring of risk- and protective factors (15) in a sample of patients at high-risk for suicide during Christmas time could shed light on the mechanisms involved in this change point.

We were able to replicate the finding that suicides are elevated on Mondays and Tuesdays (16). The increase of suicide rates around Easter and Whitsun in our study replicates the known peak of suicides in springtime (16). We also replicated the lower than average suicide rate in winter. The selection of the control periods allowed us to disentangle the seasonal effects of suicides from the variations around the holidays in question. In contrast to the Christmas holidays, neither other major holidays nor weekends were associated with a comparable decrease of suicides. Thus, the mechanisms involved at Christmas may be unique and likely go beyond a mere holiday or social bonding effect.

The findings may be relevant for clinical practice and suicide preventive efforts. Because of the myth that suicide risk is high around Christmas, clinicians may be unnecessarily quick at admitting patients or too cautious when discharging patients around Christmas, but may not be aware of the peak of risk on New Year's day. Discharges could be postponed past New Year's day. Follow-up contacts, which are recommended after inpatient suicide prevention, may also be planned on New Year's day. Rising public awareness about the abrupt end of the protective Christmas-effect may enhance help-seeking or delivering help at the beginning of the New Year.

The limitations in this study include a restricted number of years, probably blurring smaller effects, for example spikes of suicides on individual days or interaction effects with the day of week. Due to the restriction of the data to keep the anonymity of the suicide victims, we were not able to perform any subgroup analyses by age, religious affiliation etc. Thus, we were not able to replicate subgroup differences observed in previous studies. We have discussed several mechanisms (hopelessness, reasons for living/dying, social support, connectedness, alcohol consumption, religiousness etc.) that may explain the protective effect of Christmas and the changes around New Year, but the data does not allow causal inferences. Again, future studies may benefit from using the real time monitoring approach (15) of the relevant factors among high-risk individuals around Christmas or other holidays. One strength of this

study was that we contrasted the findings of Christmas with those of other major holidays and the use of Bayesian changepoint analysis.

To sum up, we could replicate with Austrian data that Christmas is associated with fewer suicides and with a peak on New Year's day, but not with an above-average upswing in New Year's week. This finding may help to counteract myths common in suicide prevention. Furthermore, the timing of suicide preventive efforts may be adjusted according to the findings.

Acknowledgements: none

Conflict of Interest: none declared

Key points:

- Christmas is associated with fewer suicides in our Austrian study, too
- No other public holiday was associated with a comparable decrease of suicides
- We could replicate the peak of suicides on New Year's day with our data, but not the above-average upswing of suicides in New Year's week.
- The findings may help counteract the myth that suicides peak on Christmas
- The timing of suicide preventive efforts may be adjusted according to the findings

References

1. Ajdacic-Gross V, Lauber C, Bopp M, Eich D, Gostynski M, Gutzwiller F, et al. Reduction in the suicide rate during Advent--a time series analysis. *Psychiatry Res.* 2008 Jan 15;157(1-3):139-46.
2. Carley S, Hamilton M. Best evidence topic report. Suicide at christmas. *Emerg Med J.* 2004 Nov;21(6):716-7.
3. Jessen G, Jensen BF. Postponed suicide death? Suicides around birthdays and major public holidays. *Suicide Life Threat Behav.* 1999 Autumn;29(3):272-83.
4. Phillips DP, Wills JS. A drop in suicides around major national holidays. *Suicide Life Threat Behav.* 1987 Spring;17(1):1-12.
5. Sansone RA, Sansone LA. The christmas effect on psychopathology. *Innov Clin Neurosci.* 2011 Dec;8(12):10-3.
6. Bergen H, Hawton K. Variation in deliberate self-harm around Christmas and New Year. *Soc Sci Med.* 2007 Sep;65(5):855-67.
7. Jessen G, Jensen BF, Arensman E, Bille-Brahe U, Crepet P, De Leo D, et al. Attempted suicide and major public holidays in Europe: findings from the WHO/EURO Multicentre Study on Parasuicide. *Acta Psychiatr Scand.* 1999 Jun;99(6):412-8.
8. Voracek M, Sonneck G. Telephonic service utilization in a crisis intervention centre: Some findings, similar to temporal variation in suicides. *Arch Suicide Res.* 1999;5(2):125-39.
9. Gabennesch H. When Promises Fail - a Theory of Temporal Fluctuations in Suicide. *Soc Forces.* 1988 Sep;67(1):129-45.
10. Herea SG, Scripcaru C. Statistical analysis of suicide characteristics in Iasi County. *Rev Med Chir Soc Med Nat Iasi.* 2012 Jul-Sep;116(3):674-80.
11. Aydin A, Gulec M, Boysan M, Selvi Y, Selvi F, Kadak MT, et al. Seasonality of self-destructive behaviour: seasonal variations in demographic and suicidal characteristics in Van, Turkey. *Int J Psychiatry Clin Pract.* 2013 Jun;17(2):110-9.
12. Ioannidis JPA. Why most published research findings are false. *Plos Med.* 2005 Aug;2(8):696-701.
13. Erdman C, Emerson JW. bcp: An R Package for Performing a Bayesian Analysis of Change Point Problems. *Journal of Statistical Software.* 2007;23(3):1-13.
14. R Core Team. R: A Language and Environment for Statistical Computing. Vienna, Austria: R Foundation for Statistical Computing; 2013.
15. Schiepek G, Fartacek C, Sturm J, Kralovec K, Fartacek R, Ploderl M. Nonlinear dynamics: theoretical perspectives and application to suicidology. *Suicide Life Threat Behav.* 2011 Dec;41(6):661-75.
16. Woo JM, Okusaga O, Postolache TT. Seasonality of suicidal behavior. *Int J Environ Res Public Health.* 2012 Feb;9(2):531-47.

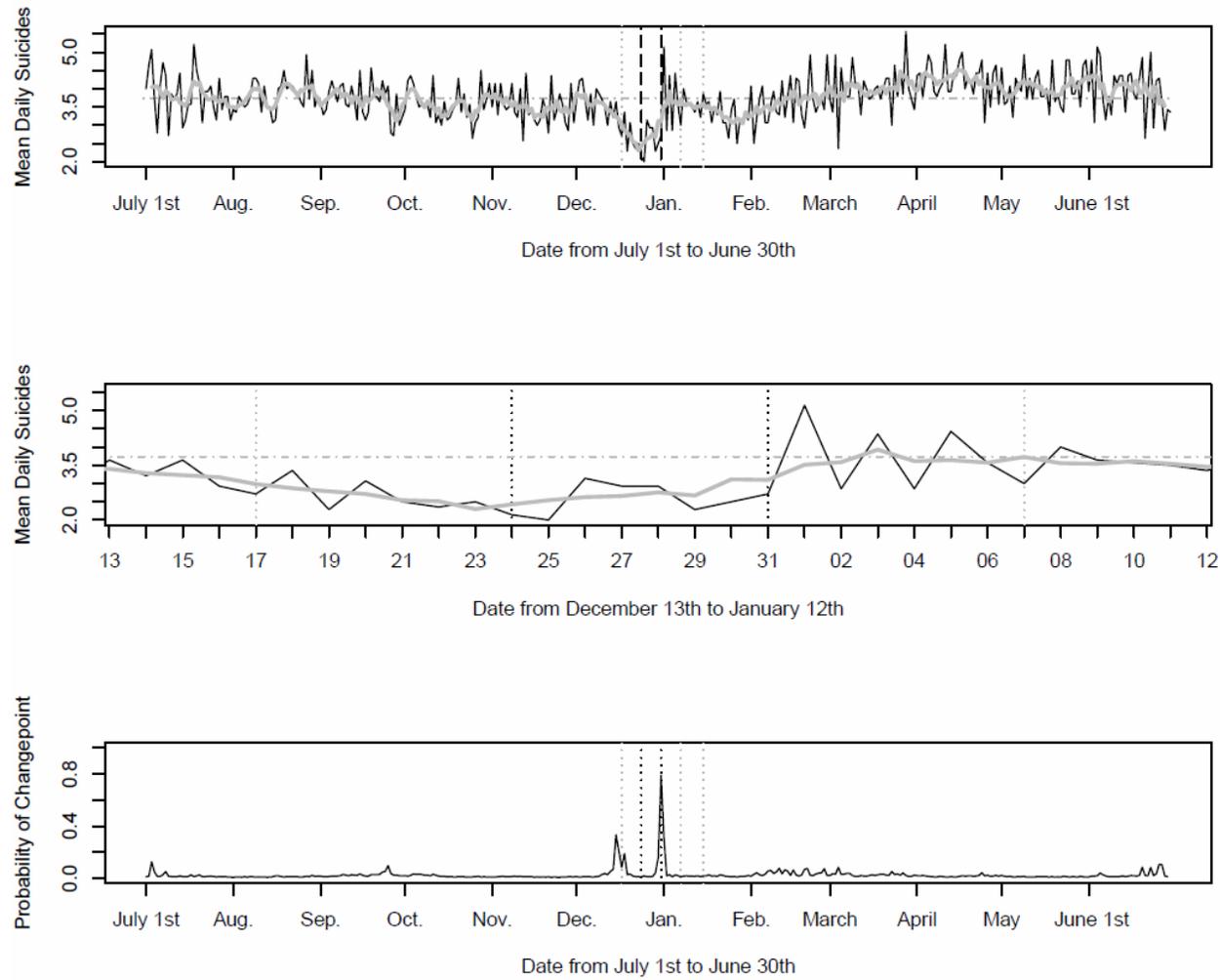


Figure 1. Top panel: Daily suicides, smoothed with 5-day moving average (gray line). Christmas holidays are the vertical dotted black lines, the weeks before/after are vertical gray lines. Middle-panel: Zoomed part of top panel. Lower panel: Posterior probability of Bayesian changepoint analysis.

Table 1

Mean daily number of Suicides (Standard Deviation) at Christmas and other holidays 2000-2013

	Christmas Dec. 24-31	New Years day	Easter	Whitsun	Summer 1	Summer 2	Weekend (Saturday, Sunday)
Holiday	2.58 (0.41)**	5.14 (-)**	3.86 (0.79)	3.54 (0.72)	3.81 (0.55)	3.77 (0.56)	3.44 (0.64)**
Week before	2.68 (0.40)**	2.64 (0.40)**	4.23 (0.87)	4.08 (0.55)	3.62 (0.41)	3.85 (0.52)	3.64 ^a (0.58)
Week after	3.74 (0.91)	3.58 (0.69)	4.67 (1.02)**	4.05 (0.51)	3.74 (0.54)	3.86 (0.43)	4.20 ^b (0.68)**
Rest of Year ^c	3.88 (0.57)**	3.88 (0.56)**	3.64 (0.66)**	3.65 (0.68)**	3.68 (0.72)*	3.67 (0.72)**	-
Control Period ^d	3.44 (0.45)	3.42 (0.45)	4.03 (0.69)	4.08 (0.76)	3.87 (0.67)	3.92 (0.66)	-

Notes. 1: Summer 1: summer break in any of the provinces. Summer 2: summer break in all of the provinces

^aWednesday to Friday, ^bMonday and Tuesday combined, ^cYear minus holidays, minus a week before/afterwards, and minus the control period.

^cControl period of 60 days, i.e., 30 days before/after the week around the holidays

* $p < .05$, ** $p < .01$ in regression analysis, when compared to the control period, see Table 2.

Table 2

Results of the Poisson Regression - Incidence Rate Ratios (95% Confidence Intervals)

	<i>Christmas</i> <i>Dec. 24-31</i>	New Years day	Easter	Whitsun	Summer 1	Summer 2	Weekend (Saturday, Sunday)
Holiday	0.75 (0.67-0.85)**	1.50 (1.19-1.90)**	0.96 (0.87-1.06)	0.87 (0.75-1.00)	0.98 (0.94-1.03)	0.96 (0.92-1.01)	0.94 (0.9-0.97)**
Week before	0.78 (0.69-0.89)**	0.77 (0.68-0.88)**	1.05 (0.95-1.16)	1.00 (0.90-1.11)	0.94 (0.84-1.04)	0.98 (0.91-1.06)	reference category
Week after	1.09 (0.98-1.21)	1.05 (0.94-1.17)	1.16 (1.05-1.28)**	0.99 (0.90-1.10)	0.97 (0.87-1.08)	0.98 (0.89-1.1)	1.15 (1.12-1.19)**
Rest of Year	1.13 (1.08-1.17)**	1.13 (1.09-1.18)**	0.90 (0.87-0.94)**	0.90 (0.86-0.93)**	0.95 (0.92,0.99)*	0.94 (0.9-0.97)**	-

Notes. Summer 1: summer break in any of the provinces. Summer 2: summer break in all of the provinces.

^aWednesday to Friday, ^bMonday and Tuesday combined.

^aWednesday to Friday, ^bMonday and Tuesday combined, ^cYear minus holidays, minus a week before/afterwards, and minus the control period.

^cControl period of 60 days, i.e., 30 days before/after the week around the holidays

** $p < .05$, ** $p < .01$ in regression analysis (compared to control period).