Holidays, Birthdays, and Postponement of Cancer Death

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Context Articles in the medical literature and lay press have supported a belief that individuals, including those dying of cancer, can temporarily postpone their death to survive a major holiday or other significant event, but results and effects have been variable.

Objective To determine whether, for the patient dying of cancer, a “death takes a holiday” effect showing a reduction in deaths in the week before a significant event was associated with Christmas, the US holiday of Thanksgiving, or the date of the individual’s birthday.

Design, Setting, and Subjects Analysis of death certificate data for all 1269474 persons dying in Ohio from 1989-2000, including 309221 persons dying with cancer noted as the leading cause of death.

Main Outcome Measure We measured the total number of cancer deaths in the 2 weeks centered on the event of interest and the proportion of these deaths that occurred in the week before the event to determine whether this proportion was significantly different from 0.5 by using an exact binomial test.

Results The proportion of persons dying of cancer in the week before Christmas, Thanksgiving, and the individual’s birthday was not significantly different from the proportion dying in the week after the event ($P = .52, .26, \text{ and } .06$, respectively). However, among black individuals there was an increase in cancer deaths in the week before Thanksgiving ($P = .01$), whereas women showed an increase in cancer deaths in the week before their birthday ($P = .05$). There was no statistically significant excess of deaths in the postevent week in any subgroup.

Conclusion We found no evidence, in contrast to previous studies, that cancer patients are able to postpone their deaths to survive significant religious, social, or personal events.

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studies have reported a significant effect in this subgroup, and there is no superimposed seasonal pattern.

METHODS

Data Sources
We examined data from death certificates representing all deaths in Ohio from 1989-2000. These data were obtained from the Ohio Department of Health as the Ohio Mortality Public Use Statistical File, as submitted to the National Center for Health Statistics (NCHS). The leading cause of death was encoded by using the NCHS 113 coding system. The file includes individual data for 61 variables, including date of birth, date of death, sex, race, ethnicity, and leading cause of death. The race and ethnicity information on all cases was that recorded by the physician on the individual’s death certificate and subsequently entered into state and national databases. We included such information because previous studies reported a death postponement effect in racial subgroups.

Because no individuals were living, under 45 CFR 46 §46.102(f) institutional review board approval was not required.

Study Sample
Our study included all persons with NCHS 113 codes of 18-40 (corresponding to International Classification of Diseases, Ninth Revision codes of 140-208, malignant neoplasm) as the leading cause of death. For comparison, noncancer mortality includes the remaining NCHS 113 codes 1 to 17 and 41 to 113 for all other causes of death. These causes include infectious diseases (codes 1-17), cardiovascular diseases (codes 49-60), cerebrovascular diseases (code 61), respiratory infection and diseases (codes 67-76), and accidents and unintentional injuries (codes 96-104), among others. Individuals born or dying on February 29 were excluded from analysis.

Significant Events
We chose 5 events as potentially meaningful or symbolic: Christmas, the US holiday of Thanksgiving, and the individual’s birthday. Christmas, celebrated on December 25, and Thanksgiving, observed on the fourth Thursday of November, are major religious and secular holidays in the United States, respectively. To determine whether there was a decrease (“dip”) in mortality before a significant event, followed by a subsequent increase (“peak”), we tabulated the number of deaths per week for the 2 weeks centered on the specific event. The week before the event was defined as the 7 days leading up to and including the event, consistent with previous studies. The magnitude of the dip-peak effect is defined as the sum of the percentage of reduction in the number of deaths in the week before the event plus the percentage of increase in the number of deaths in the subsequent week, both compared with the mean number of deaths per week for the 2-week period.

Statistical Analysis and Power Estimates
We hypothesized that the significant event has no effect on mortality and that the proportion of individuals dying of cancer in the week before a significant event will be equal to half of the total number of deaths in the 2-week interval centered on the event. We compared the proportion of people dying in the week before each event to our expected proportion of 0.5 by using an exact binomial test with statistical significance defined as P<.05. With approximately 12,000 deaths in the 2-week period centered on each event, our sample had 90% power to detect a 1.5% dip in the observed proportion of individuals dying in the week before the event, or a combined 3.0% dip-peak effect, using a .05 2-sided level of significance. The American Religious Identification Survey shows that approximately 80% of Americans identified themselves as Christian during the period 1990-2001. Excluding individuals for whom Christmas likely held little or no significance, our remaining sample could detect a dip-peak effect of at least 3.4% for this holiday. As a secondary post hoc analysis, the number of deaths on the day of the event was compared with the mean number of deaths per day per year for the 2-week period centered on the event by using analysis of variance. STATA version 8 (StataCorp LP, College Station, Tex) was used for all statistical analyses.

RESULTS

In Ohio from 1989-2000, 1,269,474 persons died, including 309,221 persons dying with cancer as the leading cause of death (TABLE 1). The distribution of the mean number of deaths caused by cancer and noncancer causes by week of the year (FIGURE) shows the usual winter increase in noncancer mortality, with a peak in the last week of December and first 2 weeks of January.11-13 Cancer mortality shows little seasonal variation.

For Christmas, Thanksgiving, or the individual’s birthday, during the 12-year period there was no significant difference in the proportion of patients dying in the week after the event compared with the proportion dying in the week before the event (TABLE 2). No significant effects were observed during the Christmas period according to sex, race, or age (<70 years vs 70 years). However, black Ohioans were more likely to die of cancer during the week before Thanksgiving than during the week after the holiday, unlike white persons, who showed simi-
lar proportions dying each of the 2 weeks. Although overall birthday data showed no effect, women dying of cancer were more likely to die during the week before their birthday compared with the following week. Men showed no significant differences. In no subgroup was a statistically significant decrease of deaths observed in the week before the event.

In the secondary analyses, there were no differences in the numbers of deaths on either Christmas ($P = .83$) or Thanksgiving ($P = .08$) compared with the number of deaths on each day in the 2-week period centered on the holiday. There was an increase in the total number of deaths on a person’s birthday ($P = .008$), consonant with the $P$ value of .06 for the dip-peak effect for the period.

**COMMENT**

For cancer deaths, our study failed to substantiate previous reports that dying persons can intentionally postpone death to survive personally significant events. The size of our sample makes it unlikely that we failed to detect an important dip or peak effect because previous studies have demonstrated large dip-peak differences, up to 70%.

Although we cannot eliminate the possibility that a small number of dying cancer patients have the ability to control the timing of their death, the proportion would have to be much smaller than that previously reported. In contrast to studies that used select, small samples of individuals representing specific racial or religious groups, our study of a large racially and ethnically mixed sample offers generalizability to the even larger population of more than 500,000 people dying each year of cancer in the United States.

We focused on death caused by cancer rather than all-cause mortality or mortality due to unintentional natural causes for a number of reasons. A concept or potential mechanism of intentional death postponement is most tenable in persons dying of a chronic disease during an extended time. Previous studies have included analyses indicating an ability to delay death in subgroups of persons noted as dying of cancer. Although the cause-of-death coding system we used to select our sample easily identifies persons dying of cancer, differentiating between acute and chronic forms of noncancer causes of death is more difficult. Because relatively few patients dying of cancer are maintained on life support, by studying this group we have minimized the impact of family decisions to maintain or discontinue life support on the timing of death. Restricting our study to cancer deaths facilitates analysis because of the lack of confounding seasonal variation in mortality.

Finally, without evidence of geographic differences in seasonal patterns of cancer mortality, our study of cancer deaths in Ohio should be generalizable to the larger population of persons dying of cancer.

The tendency for blacks to die more frequently in the week before Thanksgiving is surprising. Similarly, the increase in cancer deaths for women the week before their birthday appears to contradict previous studies showing that women survived their birthday more frequently than men.

We believe that the best explanation for these observations is that they represent artifacts of multiple significance testing. The increase in the number of deaths on the actual birthday and not on the other holidays is from a post hoc analysis, raising the likelihood that this represents an artifact. Without an analysis of the actual time of death and its relationship to any celebration, it is difficult to attach particular significance to this observation.

There are a number of factors that could have contributed to the differences from previous studies. First, the positive results in many of the articles have represented multiple comparisons in small sample sizes, which could introduce statistical error. One reported positive effect represents a deviation of 71 deaths from the expected total of 621 deaths; another represents a deviation of 36 deaths from an expected total of 103, and a third study performed 109 tests of significance in samples of 354 and 58 subjects. Two of the studies related to Jewish holidays have been criticized in that decedents were not necessarily Jewish and that the significant events, Yom Kippur and Passover, were not both analyzed in each study.

The unspecified psychological mechanisms proposed in many articles associating death with symbolic occasions are not supported by direct evidence that...
such processes exist. Similarly, there has not been convincing evidence of coping mechanisms or optimistic attitude affecting survival in cancer.\textsuperscript{15,16} Plausible nonpsychosomatic mechanisms exist for the ability of a patient to temporarily delay or hasten his or her impending death. Patients may choose to either forgo or accept good supportive care, including nutrition, hydration, and the use of antibiotics and palliative medications. Nevertheless, regardless of these choices, the time scale on which these interventions may exert their effect is unlikely to permit a patient to select a specific date before or on which to avoid death. Common perceptions of this effect (among physicians, as well as the public) may represent an example of the availability heuristic,\textsuperscript{17} a cognitive bias in which we recall more easily deaths that occurred immediately after important events because they were so striking, compared with the greater number that occurred at random times, and thus mentally assign them an exaggerated prevalence.

Several potential limitations of our study need to be addressed. Although we have chosen 3 specific and easily noted events of general impact, other personally salient events such as weddings, anniversaries, and graduations could present greater emotional impact for the individual with cancer and thus have a greater effect on the timing of death. Unfortunately, no practical means exist to ascertain the impact of these events in large population-based registries for the hundreds of thousands of persons dying of cancer. We are additionally unable to determine from our database the proportion of individuals who were comatose before death and therefore were incapable of knowing the approach of a holiday. Although children may have no association with a landmark date, only 881 cases (0.29%) of our sample were aged 12 years or younger at their death from cancer, so their impact on these results would be minimal.

The potential influence of the location of an individual’s death on the timing of death is difficult to evaluate.

Although our database includes information on whether the individual died in a hospital, nursing home, or at home, we have no information on the length of time a person was in that setting before death. Although observing a holiday or birthday at home and surrounded by family and friends might have a more pronounced effect on death postponement until after the occasion, home care with increased stress on family caregivers could have the opposite effect.

The proximity of the Christmas and New Year’s holidays could confound results in that a post-Christmas peak in deaths may be obscured by a pre–New Year’s dip in deaths. Were this to have occurred, the “double dip” would have decreased the total number of deaths throughout the 2-week Christmas period. However, the Christmas period had the largest number of deaths of the 3 events (Table 2). Additionally, we saw no dip or peak effect with either Thanksgiving or birthdays.

Our data are subject to error from the misclassification of cause of death on death certificates. An 18% underestimation of cancer deaths because of other causes of death being noted on the death certificates has been reported.\textsuperscript{18} The impact on the power of this study would have been at most a 0.3% reduction. There is no reason to believe that an increased dip or peak effect would be observed in potential subjects lost because of misclassification. On the other hand, deaths due to noncancer causes may be erroneously


<table>
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<tr>
<th>Event</th>
<th>Total Deaths in Week Before and After Event, No.</th>
<th>Deaths in Week Before and Including Event, No.</th>
<th>Deaths in Week Before Event, % (95% CI)</th>
<th>P Value†</th>
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<td>50.9 (49.7-52.1)</td>
<td>.13</td>
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</table>

Abbreviation: CI, confidence interval.

*Deaths with malignant disease noted as the leading cause of death on the death certificate.
†P value is from an exact binomial test for the proportion of deaths in the week before the event equal to 0.5 of the total deaths for the 2-week interval.
classified as caused by cancer. Given that deaths due to noncancer causes showed a dramatic seasonal pattern, if a large number of noncancer deaths were included in our sample, we would have expected a seasonal mortality pattern to emerge.

In conclusion, analysis of thousands of cancer deaths shows no pattern to support the concept that “death takes a holiday.” We find no evidence that cancer patients are able to postpone their death to survive Christmas, Thanksgiving, or their own birthdays.

**Author Contributions:** Dr Young had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

**Study concept and design:** Young.

**Acquisition of data:** Young.

**Analysis and interpretation of data:** Young, Hade.

**Drafting of the manuscript:** Young.

**Critical revision of the manuscript for important intellectual content:** Young, Hade.

**Statistical analysis:** Young, Hade.

**Obtained funding:** Young.

**Administrative, technical, or material support:** Young, Hade.

**Study supervision:** Young.

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**Role of the Sponsor:** The funding organization did not participate in the design and conduct of the study; the collection, analysis, and interpretation of the data; or the preparation, review, or approval of the manuscript.

**REFERENCES**


*If you look at life one way, there is always cause for alarm.*

—Elizabeth Bowen (1899-1973)