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Time Trends in a Study of 440 Mass Slayings/Rampages Occurring in Public Places*

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ABSTRACT: We looked for variations in the timing of mass slayings/rampages (MS/R) committed in public places by solitary perpetrators. News reports on 440 MS/R from 1920 to 1996 yielded 379 onset times which were examined for temporal patterns. There was a dramatic increase in the number of MS/R from 1966 to 1995. We observed a significant monthly variation with peaks in July-August and December, and a bimodal daily rhythm for MS/R onset with a major peak at 11:00 a.m. and a minor peak at 8:00 p.m. Observed time trends for MS/R could help develop protective programs to reduce stress and violence in public places.

KEYWORDS: forensic science, mass slayings, rampages, shooting spree, time trends, cosinor analysis

We examined news reports of 440 mass slayings and rampages in public places by solitary perpetrators from 1920 to 1996, and we have identified certain significant time trends for these crimes. We have also noted several characteristics that appear to be shared by perpetrators of mass slayings/rampages and a group of attackers and near-lethal approachers studied by Fein and Vossekuil (1,2) for the U.S. Secret Service.

Methods

Calendar dates for 420 mass slayings/rampages (MS/R) were obtained from a review of approximately 60,000 murders listed in *The New York Times Index* for the period 1920–1996. Dates for an additional 20 MS/R were obtained from the NEXUS and DIALOGUE data bases from 1968 to 1996. Of the 440 MS/R, 380 occurred in the United States, 44 MS/R in other Northern Hemisphere countries, and 16 in Southern Hemisphere countries. Of the 380 U.S. crimes, 155 occurred in the Northeast, 91 in the South, 81 in the West, and 53 in the Midwest.

News accounts of each crime were obtained from the serials collection at Harvard University Library or recently published news stories. The MS/R were committed by perpetrators who acted alone and the crimes occurred in public places such as streets, offices, stores, factories, and dining facilities. The MS/R did not involve robbery, bar fights, illegal drugs or alcohol, or gang or mob violence. The perpetrators were not identified as having convictions for major crimes or treatment for alcohol or drug abuse, and they were never described as appearing intoxicated at the time of the MS/R. Only 5% of the perpetrators were identified as having had prior treatment for mental illness, and only three of the MS/R occurred at a mental health facility. The news articles generally contained little information regarding a perpetrator's specific situation at the time of their crime, such as loss of significant relationships, social isolation, changes in financial status or living arrangements, personal rejections, or the development of intolerable stress in the weeks or months prior to the crime (1,2).

The hourly pattern in the number of MS/R ($N = 379$) was quantified by cosinor analysis using linear regression with sine and cosine waves (3). A similar cosinor analysis was also performed on the number of MS/R between 7:00 a.m. and 11:00 p.m. ($n = 332$) to determine if our model reflected true biological variation during the waking day.

Mean values are given as mean $\pm$1SD, and groups are compared using the two-tailed t statistic.

Results

The 440 MS/R resulted in the deaths of 1351 victims and 175 perpetrators, and physical injuries to 1794 other victims. The majority (97%) of perpetrators were male (mean age = 35.6 $\pm$ 12.8 yrs; range: 14–96 yrs). A substantial number of perpetrators (31%) committed suicide, and an additional 9% were killed by police during the MS/R.

The mean number of victims killed or wounded per MS/R was 7.1 $\pm$ 9.6. The mean number of victims killed where the perpetrator died was significantly greater than where the perpetrator was captured (3.7 $\pm$ 4.5 vs. 2.6 $\pm$ 3.9; $t = 2.74$; $p < .01$). Most perpetrators had some knowledge of firearms which were used in 87% of MS/R, and larger firearms (rifles and shotguns) were employed in 40% of MS/R. When pistols were used ($n = 158$), the average number of killed and wounded was 5.0 $\pm$ 5.0 per MS/R, compared to 8.5 $\pm$ 8.2 killed and wounded per MS/R where only rifles or shotguns were used ($n = 107$; $t = 4.41$; $p < .0002$). Edged weapons such as knives were used in 13% of MS/R.

The rate of occurrence of MS/R in the U.S. remained stable from 1921 to 1965, but from 1966 to 1995, MS/R increased dramatically (Fig. 1) in a discontinuous, step-wise manner with a doubling of the frequency of MS/R during consecutive time periods of decreasing length. When the MS/R were normalized to the U.S. population (right axis of Fig. 1), the same qualitative pattern emerged.

We observed a major peak for the onset of MS/R ($n = 379$) in

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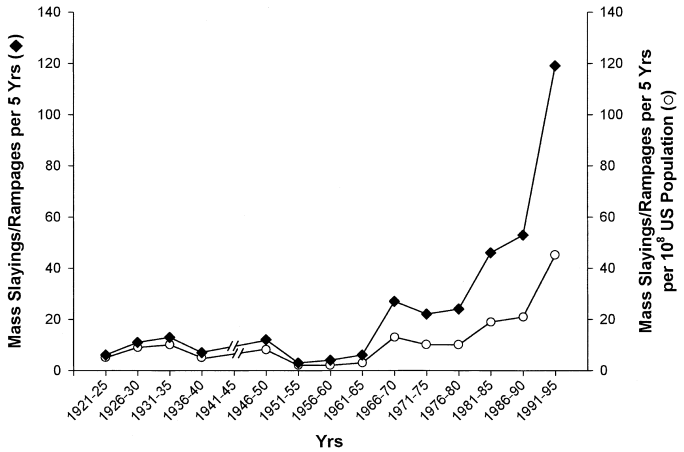

FIG. 1—*The left axis depicts the temporal distribution by five-year periods of 353 mass slayings/rampages occurring in the U.S. during 1921 through 1995. The right axis depicts the normalization of these data to the total U.S. population at the end of each five-year period (i.e., the total U.S. population in 1925, 1930, 1935, . . ., 1995). The mass slayings/rampages from January 1941 through December 1945 are not included because of wartime censorship and shortages of newsprint.*

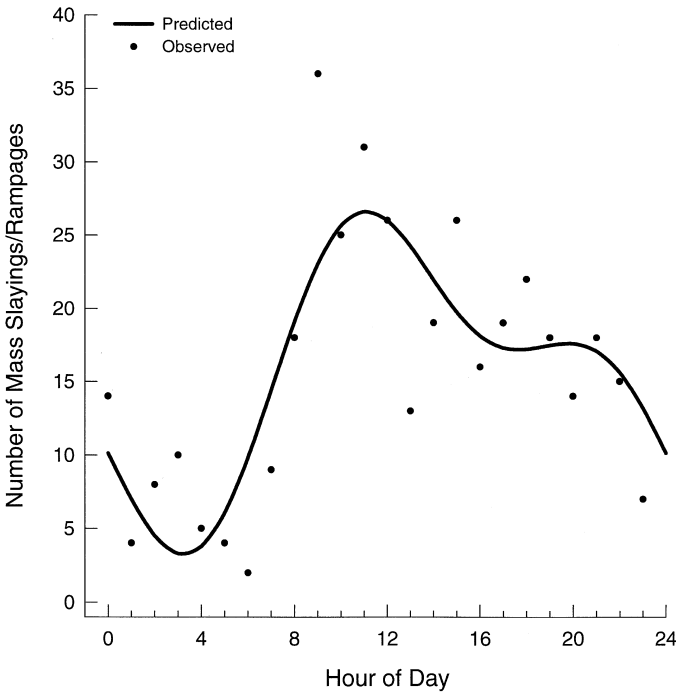

FIG. 2—*The distribution of the times of onset for 379 mass slayings/rampages over the 24-h day and the predicted curve using two-harmonic (12-h and 24-h) regression analysis with a major peak at 11:00 a.m. and a minor peak at 8:00 p.m..*

the morning at 11:00 a.m. and a minor peak in the evening at 8:00 p.m. (Fig. 2). The cyclic behavior is statistically significant, since both the 12-h ($p = .029$) and the 24-h ($p = .0006$) harmonic components are significant. The same significant bimodal cyclic behavior occurred during the waking day.

The MS/R showed no rhythms related to the day of the week ($p = .53$). A comparison of Winter (November 1 to March 1) and Summer (May 1 to September 1) for MS/R were not significant ($p = .18$). However, there was significant variation by month ($p = .005$) with peak monthly rates for MS/R in July, August, and December.

Discussion

The dramatic increase in the rate of MS/R in the U.S. from 1966 to 1995 (Fig. 1) was derived from newspaper accounts, and this rate increase could arise from enhanced media attention. However, the growth in MS/R from 1966 to 1995 was coincident with significant increases in U.S. (4) and New York City (5) homicide rates derived from F.B.I. and police data that are independent of media reporting and reflect a growth in societal violence during this period of time. Other possible factors that could influence the change in the frequency of MS/R are complex and could include changes in social cohesion of neighborhoods (6) and desensitization to the consequences of violent acts portrayed in the media (7).

The significant variation in monthly MS/R with peaks in July, August, and December may reflect the increases in the monthly homicide rates for July, August, and December summarized from five studies of homicide in the U.S. from 1932 to 1983 (8), and a study of homicide from Finland from 1957 to 1995 (9). The summertime peak for MS/R could be related to the increased temperature of the summer months (8), and the December peak could be associated with heightened stress and social isolation during the holiday season.

The onset times for MS/R had a bimodal daily rhythm with a major peak at 11:00 a.m., and a minor peak at 8:00 p.m. The timing of the major peak for MS/R in the morning raises the possibility that *the witnesses* of morning-time MS/R may be at significant risk to develop acute cardiovascular disorders as a consequence of their exposure to violence during the morning hours. Firstly, the major peak for MS/R coincides with changes in the level of arousal in early to mid-morning when daily activities are usually initiated and increased stress and frustration may occur. Secondly, the major peak for MS/R shows a remarkable correspondence with the major morning-time peaks for certain acute cardiovascular disorders such as myocardial infarction, sudden cardiac death, and cardiac arrhythmias (10,11). Thirdly, although time of day was not reported, Shalev, et al. (12) observed that elevated heart rates in the emergency room after extreme events (most were traffic accidents) were associated with the subsequent development of post-traumatic stress disorder, and three recent studies (13–15) have reported that some witnesses to MS/R developed post-traumatic stress disorder which persisted for many months.

The extraordinary increase in MS/R in recent decades reflects the epidemic of violence in our society, and we hope that the daily and monthly time trends for MS/R described here may be useful in the design of protective programs to anticipate and reduce stress and violence in places of public gathering and the workplace.

In their research for the U.S. Secret Service, Fein and Vossekuil (1,2) conducted an elaborate study of 83 American attackers and near-lethal approachers based on legal and clinical records and personal interviews, and there are several characteristics that may be shared by this group of individuals and the perpetrators of MS/R. Most of the individuals studied by Fein and Vossekuil (1,2) were male, their mean age was similar to that for the perpetrators of MS/R, and most acted alone. Fein and Vossekuil (1,2) reported that 44% of their subjects had histories of serious depression or despair, and had either seriously considered suicide or had actually at-

tempted suicide. Although few perpetrators of MS/R were described in news stories as having had treatment for mental illness, 31% of the perpetrators of MS/R committed suicide. This raises the possibility that a substantial number of perpetrators of MS/R had depression or despair which might have responded to treatment. Fein and Vossekuil (1,2) noted that most of their subjects had histories of firearms use, but few had prior arrests for violent crimes. Most perpetrators of MS/R employed guns, but none were identified as having prior convictions for major crimes. The majority of attackers and near-lethal approachers studied by Fein and Vossekuil (1,2) did not have histories of substance abuse, and substance abuse was not noted in the perpetrators of MS/R. Other important measures examined by Fein and Vossekuil (1,2) could not easily be determined solely from the limited personal information about perpetrators of MS/R in news accounts, e.g., losses of personal relationships or living arrangements, financial problems, and the presence of social isolation or intolerable stress. However, we believe that the methods used by Fein and Vossekuil (1,2) such as detailed information gathering by law enforcement officials with training in mental health and the development of a national data base could be extended to develop protective intelligence and threat assessment programs for MS/R.

Acknowledgments

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