

Do Significant Terrorist Attacks Increase the Risk of Further Attacks?

Initial Observations from a Statistical Analysis of Terrorist Attacks in the United States and Europe from 1970 to 2013

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I wouldn't go there now. They just had a terrorist attack.

With last week's terrorist attack in Paris, is it safe for me to fly to New York?

While there is no specific intelligence indicating a terrorist threat, in light of the recent terrorist attacks, security has been increased.

The statements above are typical of those that follow any major terrorist event. Some of them reflect understandable anxiety. Attacks in the United States and Europe seem to generate more fear among the public in the West and prompt swifter responses from public officials than attacks in other parts of the world. In some cases, official travel warnings and security advisories reminding people to exercise vigilance reinforce

apprehension. Visible increases in security reflect prudence but also suggest that there is reason to worry about further terrorist attacks.

Inherent in these comments and actions is the presumption that a major terrorist attack somehow increases the likelihood that another attack will soon occur—or at least the concern that another attack will soon occur. In other words, these comments reflect a belief that terrorist attacks occur in clusters. If there is one attack, others will soon follow. That leads to two analytical questions: Does a significant terrorist attack somehow inspire other terrorist attacks, and can terrorist attacks be anticipated statistically?

To answer these questions, we have examined the historical record of terrorism in the United States and Europe between 1970 and the end of 2013. We divided the historical record into three periods: 1970 to 1993,¹ 1994 to 2002, and 2003 to 2013. The reason for this division was to try to discern any major shifts

in statistical patterns caused by changes in the nature of terrorist activity worldwide. For example, domestic groups motivated by ideology and separatist causes dominated the period from 1970 to the early 1990s. The 1990s saw declining activity by these groups but increasing terrorist activity connected with Islamic extremism or “jihadism,” culminating in the September 11, 2001, attacks, which were unprecedented in the annals of terrorism. The period from 2003 to 2013 reflects the post-9/11 environment.

Statistical analysis of these data reveals whether terrorist attacks occur in clusters and whether those clusters are related to occurrence of major terrorist attacks or to symbolically significant anniversary dates. The data also reveal trends in the volume and lethality of terrorist attacks. These trends help to explain the patterns observed in clustering of terrorism events. Together, these observations can help people and public officials decide how to ensure safety following terrorism events.

Is Terrorism More Likely After a Major Attack?

To understand whether a major attack inspires more terrorism, we answered two questions about the patterns of how terrorist attacks have occurred.

First, are terrorist attacks statistically random or do they occur in clusters? Results of analysis summarized in Table 1 show that the distribution of *small-but-fatal terrorism events* (defined in this analysis as those killing at least one but less than three people) appears to be not random in Europe and the United States between 1970 and 2002, but it does appear random between 2003 and 2013. In other words, in the earlier period, events were more inclined to occur in clusters.

Table 1. Summary of Findings About Clustering of Terrorism Events

Time Period	Did Terrorist Events Occur in Non-Random Clusters?	Did Clusters of Events Occur in the Wake of Larger Attacks?
1970–1993	Yes	Yes, clusters appear to be related to larger events.
1994–2002	Yes	No, clusters are not explained by larger events.
2003–2013	No	Clusters were not present.

Of course, this does not mean that terrorists carry out their attacks randomly. Terrorists are systematic in plotting, planning, and carrying out their attacks. However, across the universe of attacks, it appears that, over time, terrorism occurs with a frequency and distribution that would be expected from a random process.

Second, in the time periods when terrorism events do not appear random, are clusters of terrorist events related to *larger, triggering events* (defined in this analysis as those killing three or more people)? A cluster of terrorist attacks following a trigger event might indicate a surge of terrorist activity or the occurrence of deadly copycat attacks. Between 1994 and 2002, occurrences of small events did not significantly relate to trigger events. But from 1970 to 1993, trigger events did produce statistically significant clustering of events in their wake. There is a historical reason for this, which we will come back to later.

Are Terrorist Attacks More Likely to Occur on Key Dates?

Warnings of possible terrorist attacks and security are often increased on key dates, which may have symbolic importance to

the terrorists or, in their eyes, are important to their foes—for example, July 4 (Independence Day) or the anniversary of the September 11 attacks for the United States. Certainly, both terrorists and those charged with security think more about these dates, but do more terrorist attacks, in fact, occur on them? To answer this question, we looked at the distribution of terrorist attacks in the United States from 1970 to 2013 by date to see if certain dates stood out.

Only a few of these dates (in bold) appear to have any possible symbolic significance. At least one attack has occurred on almost all calendar dates (352 of 365). The average number of attacks on any calendar date is just under five (mean = 4.8, standard deviation = 3). Nineteen calendar dates (those listed in Table 2) have experienced ten or more events. The days around Independence Day (July 2 and 4) and New Year’s Eve (December 31) each experienced an unusually large number of attacks. On each of these dates, communities hold events that draw large crowds, which raises the threat of terrorism by creating potential soft targets. Furthermore, any event that draws a large crowd requires increased security for public safety reasons.

More notably, specific dates that one might think would bring a heightened risk of terrorism do not appear associated with a greater number of events historically. For example, the U.S. data did not include any fatal terrorism events on September 11 following 2001, although we know that terrorists contemplated attacks on these days. Similarly, none of the dates during the observance of Ramadan has experienced significantly more terrorism in the United States and Western Europe than any other dates.²

Table 2. Calendar Dates with Significant Clusters of Terrorism Events, United States, 1970–2013

Date	Number of Events with One or More Fatalities
January 7	15
January 28	11
February 21	12
February 23	13
March 11	11
March 20	12
April 5	11
April 19	13
April 22	11
May 1	11
July 2	12
July 4	11
July 12	12
August 18	15
August 22	13
October 15	12
October 25	18
October 27	11
December 31	11

Methodology

To arrive at these conclusions, we analyzed the record of terrorist attacks using the Global Terrorism Database, which includes more than 140,000 terrorism events that have occurred worldwide.³ We analyzed a subset of this database reflecting several criteria for terrorism events.

In the United States and Europe, terrorist events occurred in clusters in the period between 1970 and 2002; after that, the distribution of events is statistically random.

Our analysis covers the period from 1970 to 2013 and includes only the United States and Europe. Specifically, we wanted to determine whether major terrorist events, or trigger events, prompt a subsequent increase in terrorist events. We selected as trigger events those incidents with three or more fatalities and the time period for analysis as the following 30 days. Follow-on events had to have at least one fatality.

To avoid ambiguity, we included only those attacks from the Global Terrorism Database that met the following criteria for terrorism:

- The act must be aimed at attaining a political, economic, religious, or social goal.
- There must be evidence of an intention to coerce, intimidate, or convey some other message to a larger audience (or audiences) than the immediate victims.
- The act must be outside the context of legitimate warfare activities.

In addition, we included all sources of terrorism, not just those attacks motivated by jihadism. And we included only attacks that had a known target, known weapon, and known attack type. These filters limit insight about incidents with no fatalities and some events that are considered terrorism by some but not others. However, statistical analysis of the resulting data reveals trends and

patterns about events from the most commonly recognized terrorist threats. In these ways, our criteria were tighter than the full Global Terrorism Database.

In our analysis of terrorism clusters, we considered two statistical hypotheses. First, we hypothesized that small terrorism events occurred at a constant and random rate.⁴ Second, we hypothesized that the pattern of small terrorism events would appear at a constant rate, which is unrelated to any other factors. Therefore, the time between terrorism events would also be random; specifically, it would be drawn from an independent and identically distributed (i.i.d.) sample drawn from an exponential distribution.

We then used two statistical approaches to test these hypotheses. To test the theory that the distribution of small terrorism events followed a constant, random process, we used two statistical hypothesis tests to examine whether a single exponential distribution can fit the data of time intervals between small events: the Kolmogorov-Smirnov test and the Pearson's Chi-square test.⁵ To test the hypothesis that the random process was unrelated to other factors, such as trigger events, we designed a set of resampling-based tests to examine if small events were more likely to occur after trigger events than were expected by chance. These tests used 1,000 repeated samples of randomly occurring trigger events to form a null distribution of a test statistic. We calculated the empirical p-value, which was the proportion of samples with a more extreme value in the test statistic than observed in the real data.⁶

The results indicated the historical pattern described above. In the United States and Europe, terrorist events occurred in clusters in the period between 1970 and 2002; after that, the distribution of events is statistically random. From 1970 to 1993, the clusters appear related to trigger events. After that, there is no evidence that

larger trigger events increased the likelihood of terrorist attacks in the following 30 days.

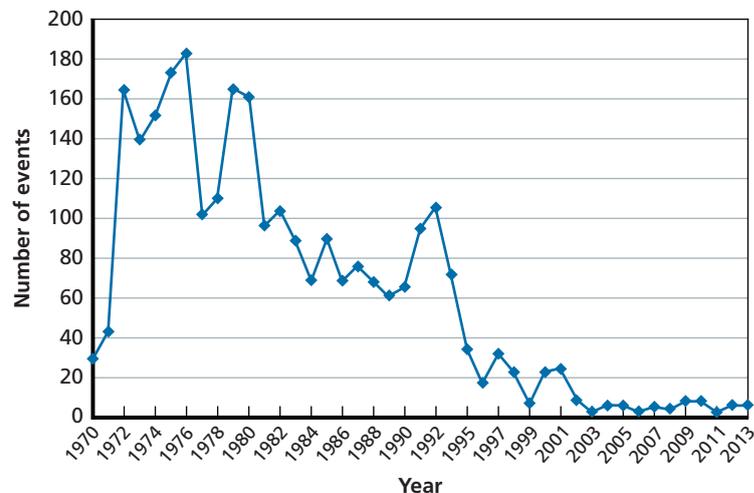
There may be a historical explanation. Terrorism in the United States and Europe from the 1970s to the 1990s was statistically dominated by groups engaged in continuing domestic campaigns of violence. The Provisional Irish Republican Army and Spain's Basque separatists (Euskadi Ta Askatasuna, or ETA) account for a large share of the total recorded activity. Attacks often came in offensive surges or what we would identify as statistical clusters. With the gradual suppression of the separatist terrorist campaign in Spain and resolution of the conflict in Northern Ireland, the clusters disappear. The abatement of activity associated with these two campaigns also explains the overall decline in the volume of terrorism in Europe.

The Volume of Terrorist Attacks in the United States and Europe Has Declined

Trends in the overall rate of terrorism underlie our analysis of terrorism clusters and help to explain observations about the clustering of terrorism events. Although the volume of terrorist incidents worldwide has increased dramatically, the volume of terrorist incidents in the United States and Europe resulting in at least one fatality has declined since the 1970s, and especially in the years since 9/11 (see Figure 1).

Again, this decline primarily reflects both the end of the terrorist campaign carried on by the Provisional Irish Republican Army and a reduction in terrorist violence by Spain's Basque separatist group ETA in the 1990s; to a lesser extent, the decline reflects the suppression of leftwing extremist groups in Germany and Italy in the 1980s. Approximately three-quarters of the trigger events

Figure 1. Number of Successful Terrorism Attacks in Western Europe and the United States



NOTE: This figure reflects data from the Global Terrorism Database for successful attacks in the United States and Western Europe that killed at least one person; were judged to, without doubt, meet all three criteria for considering an attack to be terrorism; and had a known target, weapon, and attack type. There are no data for 1993.

RAND PE173-1

between 1970 and 2002 were connected with ongoing terrorist campaigns in the United Kingdom and Spain. And during the same period, approximately three-quarters of the more than 2,600 small events (having one or two fatalities) were also connected with these same terrorist campaigns.

The frequency of attacks connected with these two terrorist campaigns also explains the greater clustering of attacks and the greater likelihood of follow-on events in the wake of the trigger events.

The relative “tranquility” during the years since 9/11 compared with the more turbulent 1970s may be explained by the following factors.

The 1970s saw more groups in the field with definable constituencies. In the 1970s, there were more terrorist groups operating in both Europe and the United States than there are today. They appealed to various ideologies, as well as ethnic and separatist sentiments—again, especially in Northern Ireland and Spain, which gave them definable domestic constituencies.

Some of the causes of terrorism in the 1970s are still motivators of violence—for example, white supremacy, which continues to inspire terrorist violence and hate crimes in the United States and abroad. And new causes have emerged, such as the ideology of armed global jihad subscribed to by al Qaeda and the Islamic State of Iraq and the Levant (ISIL),⁷ but this has remained largely a regional phenomenon. Although there have been some attacks in the United States directed or inspired by jihadist terrorist groups abroad, the focus of jihadi terrorist activities has been primarily in the Middle East and North Africa.

The jihadist groups have been able to sustain insurgencies and terrorist campaigns in conflict zones, such as Afghanistan, Iraq, Somalia, Syria, Yemen, and other countries across North Africa and

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the Middle East, and they have been able to direct or inspire occasional spectacular terrorist attacks in the United States (e.g., 9/11 in 2001; Fort Hood, Texas, in 2009; and San Bernardino, California, in 2015) and Europe (e.g., Madrid in 2004, London in 2005, and Paris in 2015). These attacks are part of a continuing global terrorist campaign, but the jihadists have not been able to field groups in the United States or Europe that are capable of sustaining terrorist campaigns like those that operated in Europe from the 1970s to the early 1990s or in the United States primarily during the 1970s.

Groups in the 1970s were better organized. As groups engaged in continuous activity, they were able to learn and refine their skills. Terrorism in the United States today is less organized. Most of the attacks and terrorist plots involve a single perpetrator or, at most, tiny conspiracies. There are no organized groups, no continuing campaigns of violence, no refining of skills. Most are one-off attacks or plots. Almost all culminate in the arrest or death of the attacker.

Counterterrorism efforts also have made it more difficult to carry on continuing terrorist campaigns. Terrorists abroad must try to export their violence to the United States through attacks launched or directed from abroad or by persuading homegrown adherents to turn to violence on their behalf. Greatly increased intelligence efforts since 9/11, continuing military pursuit, and cooperation among law enforcement worldwide have degraded the ability of these groups to assemble and carry out large-scale attacks. Thus far, exhortation from abroad has produced only a small number of responses.

Counterintuitively, the Internet may impede effective, collective action. Terrorists use the Internet to disseminate their propaganda, inform and recruit followers, and exhort them to take up arms.

But at the same time, the Internet may work against action. It offers the possibility of vicarious participation and psychological satisfaction without engaging in dangerous actions. For those committed to violence, the Internet allows, even encourages, solitary activity: The violence-prone fanatic does not have to physically contact other fanatics, and when he does, they often turn out to be confidential informants working for the authorities. The Internet facilitates communication, but it enables the authorities to identify those moving toward violence and intervene before they can carry out an attack. This further inhibits contacting others or even taking action.

After 9/11, intelligence efforts and security measures against terrorism have been significantly increased in the United States and Europe. Also, the rules have changed, enabling authorities to investigate and intervene earlier. These new laws, aimed at preventing terrorist attacks rather than apprehending terrorists after attacks, have enabled authorities to uncover and thwart many terrorist plots, which also may have a further deterrent effect on others.

Overall Lethality Has Increased

One hypothesis for the decline in terrorism events in the United States and Europe is that today's terrorists do not match the volume of attacks in the 1970s, but they have escalated their violence and are now more determined to kill in quantity. In fact, within the declining number of terrorist incidents with any fatalities, the proportion of incidents with three, five, and ten fatalities has increased in the United States and Europe.

The number of post-9/11 cases in which high body counts are clearly the objective seems to suggest an escalation of violence. However, the statistics for the United States and Europe do not

support our hypothesis that terrorists have escalated their violence; terrorists may be determined to escalate, but they have not successfully been able to do so. Incidents with one or more, three or more, five or more, and ten or more fatalities have all declined in real numbers since the 1970s and 1980s. However, the proportion of incidents with three, five, or ten fatalities has not declined as rapidly (see Table 3).

In other words, the decline in the volume of terrorist attacks has been offset by the greater determination of today's terrorists, especially those inspired by jihadist ideology, to kill in quantity, which brings us to the next observation. There are fewer incidents overall, but lethality has increased.

There may be greater aspirations by terrorists to kill in quantity. Sometimes, they have succeeded spectacularly: The scale of the 9/11 attacks was unprecedented in the annals of terrorism. But thus far, they have not been able to replicate anything near this scale. Since 9/11, only two attacks in Europe have caused more

Table 3. Number of Successful Terrorism Attacks in the United States and Western Europe, by Magnitude of Fatalities

Time Period	Number of Events with One or More Fatalities	Number of Events with Three or More Fatalities	Number of Events with Five or More Fatalities	Number of Events with Ten or More Fatalities
1970–1992 (23 years)	2,408	197	75	26
1994–2013 (20 years)	300	31	19	13

NOTE: This table reflects data from the Global Terrorism Database for successful attacks in the United States and Western Europe that were judged to, without doubt, meet all three criteria for considering an attack to be terrorism and that had a known target, weapon, and attack type. There are no data for 1993.

These findings about the absence of clustering for terrorist events around trigger events since 1994, absence of increases in terrorism on significant dates, and decline of terrorism in the West suggest that the threat of terrorism should not affect individuals' behavior and decisions in the United States and Western Europe—not even in the wake of a significant terrorist event.

than 100 fatalities, while the deadliest attack in the United States resulted in 14 deaths (in San Bernardino).

Is it because of lack of capability or strategic decision that fewer, more-lethal attacks will best achieve jihadist goals? Exhortations by jihadist terrorist groups like al Qaeda and ISIL to homegrown terrorists to carry out attacks has increased, while the response has remained small, suggesting that for homegrown terrorism, the issue is lack of sufficient determination or lack of capability.

However, Jabhat al-Nusra, al Qaeda's affiliate in Syria, also has made a point of saying that it is focusing its efforts on defeating the Bashar al-Assad regime in Syria; by inference, the affiliate is less interested in launching major terrorist attacks in the West for now, although this remains a central tenet of al Qaeda's ideology. In addition, ISIL has threatened attacks on the West and applauds those that occur. And though some perpetrators of successful attacks have proclaimed their allegiance to ISIL, and though there are some connections between foreign fighters

serving in ISIL's ranks and some of these attacks, ISIL's central command appears to be concentrating its efforts on local and regional conflicts, again for now. In both cases then, the decisions are strategic. This could change.

How Should We Respond After a Terrorist Attack?

These findings about the absence of clustering for terrorist events around trigger events since 1994, absence of increases in terrorism on significant dates, and decline of terrorism in the West suggest that the threat of terrorism should not affect individuals' behavior and decisions in the United States and Western Europe—not even in the wake of a significant terrorist event. There is no evidence that terrorism has occurred more regularly on dates perceived to be symbolically significant. When a terrorist event happens in a major city, there is no evidence that another event will happen in that city (or even elsewhere in the West) in the days or weeks afterward.

These findings alone do not necessarily imply that increasing security immediately after major attacks is unwarranted and should be discontinued. Increased security measures may still be in order for a variety of reasons; however, much of the personal anxiety about increased dangers seems unwarranted.

Theoretically, an attack may be the beginning of a terrorist campaign, but that cannot be known until there are further attacks. For example, the first terrorist attacks in Paris in the mid-1980s and again in the mid-1990s initiated a continuing campaign of terrorism. Those charged with security cannot afford to wait until there is a second or third terrorist attack to heighten security.

Heightened security may deter some activity. It also may enable authorities to respond quickly to increased reports of suspicious activity and hoaxes that terrorist events inspire. Increased

police presence also permits authorities to diagnose and intervene more rapidly if there are further incidents.

Finally, despite the evidence about clustering of terrorism events, temporary security increases may still be justified as a precautionary measure, even if only to reassure an alarmed public that it is safe. However, unless there is intelligence indicating a further threat, there is not historical justification for maintaining elevated security levels.

These findings must be interpreted carefully, considering the following caveats:

- Our analysis was confined to incidents with at least one fatality. It is possible that trigger events were followed by low-level echoes—that is, attacks with no fatalities or other kinds of events, such as threats or disruptive hoaxes. These require little preparation and therefore may occur more spontaneously.
- Heightened security measures imposed after a major, potentially inspirational attack may reduce the likelihood of further attacks, thus suppressing a clustering effect.
- The small number of events in the United States and Europe since 1994 may also mean that we may be missing subtle changes in frequency. The period from 1970 to 1993 did show a clustering effect following larger attacks.
- Imitation may follow eventually. Attacks that are seen as successful may persuade other terrorists to imitate the tactics or attack similar targets, but that tends to come later—beyond 30 days.
- Finally, this historical analysis does not preclude the possibility that future attacks will follow a different pattern.

The Dynamics and Patterns of Terrorism May Change in the Future

The perceived level of threat has been exacerbated by terrorist groups abroad using social media to attract followers in Europe and the United States and encourage them to carry out acts of terrorism. Authorities are confronted by more noise—the product of the Internet and social media—but not necessarily more action.

Reaching a broader audience in a more direct fashion through social media may result in a greater number of low-level terrorist incidents. These are mostly one-off attacks carried out by a single individual, making them hard to detect in advance.

Reported arrests and disruptions of plots suggest that there has been an increase in terrorist activity in the United States and Europe in the past two years. However, the levels of terrorism in the United States are much lower than those in Europe, and the evidence for the threat is subject to interpretation—another contentious area.

More individuals are going or attempting to go abroad to join jihadist fronts; this poses a long-term threat.

We cannot be certain about how these trends will develop, and examining terrorism events before and after 9/11 omits this single catastrophic event. Still, analysis of the historical record of terrorism highlights an observation that is both obvious and salient to security planning: Current assessments of terrorism are driven not by what terrorists have done since 9/11, but rather by what terrorists might do in the future—replicate a 9/11-scale attack or worse using weapons of mass destruction.

Notes

¹ There are no data for 1993 in the database that we used for this analysis (the Global Terrorism Database). The data go up to 1993 and then continue in 1994.

² Of small events, 6.6 percent occurred during Ramadan, as defined by the Western calendar dates retrieved from Habibur, “Hijri Date Converter,” website, undated. As of February 29, 2016: <http://habibur.com/hijri/>. On average, we would expect 7.8 percent of events to occur during any 28.6-day period, which is the average length of Ramadan.

³ The Global Terrorism Database is an open-source database of information on terrorist events around the world from 1970 to 2014; it is maintained by the National Consortium for the Study of Terrorism and Responses to Terrorism (START) at the University of Maryland. The database is available online at <http://www.start.umd.edu/gtd>.

⁴ Specifically, we analyzed whether the occurrence of terrorism followed a stationary Poisson process.

⁵ Tests to evaluate randomness (i.e., the fit to an exponential distribution) had the following results: between 1994 and 2002, Kolmogorov-Smirnov test p-value = 0.002 and Pearson’s Chi-square test (d.f. = 4) p-value < 0.0001; between 2002 and 2013, Kolmogorov-Smirnov test p-value = 0.39 and Person’s Chi-square (d.f. = 4) p-value = 0.94. Between 1970 and 1993, visual inspection of the rate of terrorism indicates that the events do not follow a constant, random process. Thus, we did not conduct a formal statistical test.

⁶ For 1970–1993, p-values were 0.03 for assessing a decrease in the time to the next small event, < 0.001 for assessing an increase in the number of small events 30 days following a trigger event, and < 0.001 for an increase in the mean event rate for the 30 days following a trigger event. Between 1994 and 2002, p-values were 0.71 for assessing a decrease in the time to the next event, 0.22 for assessing an increase in the number of events 30 days following a trigger event, and 0.25 for an increase in the mean event rate for the 30 days following a trigger event. After 2002, p-values were 0.30 for assessing a decrease in the time to the next event, 0.39 for assessing an increase in the number of events 30 days following a trigger event, and 0.68 for an increase in the mean event rate for the 30 days following a trigger event.

⁷ The organization’s name transliterates from Arabic as al-Dawlah al-Islamiyah fi al-Iraq wa al-Sham (abbreviated as Da’ish or DAESH). In the West, it is commonly referred to as the Islamic State of Iraq and the Levant (ISIL), the Islamic State of Iraq and Syria, the Islamic State of Iraq and the Sham (both abbreviated as ISIS), or simply as the Islamic State. Arguments abound as to which is the most accurate translation, but here we refer to the group as ISIL.

About the Authors

Brian Michael Jenkins, senior adviser to the president at the RAND Corporation, is the author of *Will Terrorists Go Nuclear* (2008, Prometheus Books) and of several RAND monographs, including *Unconquerable Nation: Knowing Our Enemy, Strengthening Ourselves* (2006). He formerly served as chair of the political science department at RAND. Commissioned in the infantry, Jenkins became a paratrooper and a captain in the Green Berets. He is a decorated combat veteran, having served in the Seventh Special Forces Group in the Dominican Republic and with the Fifth Special Forces Group in Vietnam. From 1999 to 2000, he served as adviser to the National Commission on Terrorism and in 2000 was appointed to the U.S. Comptroller General's Advisory Board.

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About This Perspective

RAND researchers examine the historical record of terrorism in the United States and Europe between 1970 and 2013 to determine whether a significant terrorist attack somehow inspires other attacks and whether terrorist attacks can be anticipated statistically. Funding for this study was provided by philanthropic contributions from RAND supporters and income from operations. The authors thank Fred Gerstell, in particular, for his generosity.

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Questions or comments about this report should be sent to the project leader, Henry H. Willis, at hwillis@rand.org. For more information about the Homeland Security and Defense Center, see <http://www.rand.org/hsdc> or contact the director at hsdc@rand.org.

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