

Testing The Snake Head Strategy: Does Killing or Capturing its Leaders Reduce a Terrorist Group's Activity?

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BACKGROUND

Since the attacks of 9/11 the search for effective counter-terror strategies has become an urgent priority for policy makers. Dr. Audrey Kurth Cronin, a Professor at the National War College, has argued that the United States has made numerous missteps in developing counter-terror strategies because of its limited experience with the phenomenon.ⁱ Quantitative tests on databases of terrorist activity can help us examine the effects of various strategies in order to determine their degree of impact. One strategy that is considered to be effective by conventional wisdom is "decapitation" – the tactic of removing the leadership of terrorist organizations. Besides its presumed efficacy, the decapitation strategy is also pursued as a matter of justice and in order to reassure the society targeted by terrorists that its government is taking action on its behalf. This paper tests the effectiveness of the decapitation strategy in terms of the reduction of terrorist activity.

The argument in favor of the decapitation strategy is that terrorist groups rely heavily on the abilities and charisma of their top leaders. When these leaders are removed, the organizations lose effectiveness and focus, become prone to infighting, and collapse.ⁱⁱ The choice of method complicates the decapitation strategy. Few argue against the method of arrest and trial of terrorist leaders. However, arrest is not always possible for tactical reasons such as difficult terrain or limited presence on the ground. For this reason, Israel and other states have often pursued a "Targeted Assassinations" policy of killing terrorist leaders. Opponents of the Targeted Assassinations policy argue that it is a violation of human rights and international law, and often leads to civilian casualties. Proponents argue that it is a necessary strategy against an enemy that refuses to abide by international law. The question of efficacy is rarely explored - the issue at stake is one of justice.

The decapitation strategy has occasionally succeeded in diminishing the power of terrorist groups. For example, Sendero Luminoso, which terrorized Peru in the late 1980s, was a far less deadly and effective organization after the arrest of its founder Abimael Guzman in 1992. Palestinian Islamic Jihad became less effective after its founder Fathi Shqaqi was assassinated by Israel in 1995, although it has since experienced resurgence after securing state support. However, arresting and killing terrorist leaders can also lead to negative consequences, including greater radicalization of the targeted terrorist group, elimination of possible negotiating partners, and the triggering of retaliatory attacks. Terrorist groups frequently claim that they will take revenge for the death of their leader, and in some cases have followed through on their threats. In 1992, only a month after Israel assassinated Hezbollah's

Secretary-General Abbas Musawi, a car bomb struck Israel's Embassy in Buenos Aires. Members of Egypt's Islamic Group have frequently cited the imprisonment of their spiritual leader Sheikh Rahman as one of the reasons for their attacks, including the bloody 1997 massacre at Luxor, Egypt. Innumerable hostage situations have been carried out in order to negotiate for the freedom of captured terrorist leaders.

This study examines the effect of removing the top leaders of terrorist organizations on the organizations' level of terrorist activity. It compares the different means of removal (killing or arrest) and also looks at the effects of having leaders removed multiple times. Several independent variables are tested, including the broader context of the decapitation, the group's worldview (e.g. religious, separatist, or communist), and the group's overall scale of activity. Because of the limited amount of data on the subject, the paper was able to reach few statistically significant conclusions. However, the study resulted in the finding of various interesting trends that should be explored in further research.

In general, the study found that the decapitation strategy appears to have little effect on the reduction of terrorist activity. The most notable trend from the statistical analysis was that decapitation strikes on religious terrorist groups tended to be followed by sharp increases in fatalities. This could be an important indication that decapitation strikes should be carefully considered on the basis of the type of group targeted. As this strategy is currently viewed to be effective by policy makers and is supported by public opinion, more data should be gathered in order to thoroughly study the efficacy of the tactic.

PREVIOUS STUDIES

Despite the popularity of the decapitation strategy among policy makers, there have been only a few formal quantitative studies conducted on the issue. Much of the existing research has focused on the Israeli-Palestinian arena because of Israel's long-term use of the strategy and the substantial data available. A study of the subject by Mohammed Hafez and Joseph Hatfield, involving examination of the five-week period after each terrorist event, found no substantial connection between Israel's targeted assassination strategy and Palestinian violence against Israel.ⁱⁱⁱ Writing in *Foreign Affairs*, Daniel Byman argued that there has been a marked decrease in the number and effectiveness of Palestinian attacks on Israel since the beginning of the al-Aqsa Intifada in September 2000, but that the effectiveness of the strategy may only apply to the specific circumstances of the Israeli-Palestinian conflict.^{iv} While Israel has employed targeted assassinations, it has also undertaken large-scale military incursions and built a defensive barrier separating the Palestinians from Israel and complicating the infiltration of

suicide bombers. Lastly, in some preliminary research on violent attacks in Northern Ireland from 1969-1992, Gary LaFree and Laura Dugan of the University of Maryland's START Center found that military actions in which Irish paramilitaries were ambushed and killed did not decrease terrorist activity and may in fact have contributed to an increase.^v

The studies described above do not focus strictly on decapitation strategies, because they target the groups' operational leaders – the “middle management.” Jenna Jordan of the University of Chicago conducted an extensive analysis of the effectiveness of decapitation by developing a comprehensive dataset on 290 cases that used this strategy on terrorist organizations.^{vi} The dependent variable was whether the organization remained a Foreign Terrorist Organization as defined by the United States State Department two years after the decapitation. Jordan's paper examined the efficacy of the decapitation strategy on various organizations, differentiated by age, size and type. The paper also compared the effectiveness of different aspects of the strategy: arrest versus killing, and the effect of targeting the leader versus targeting the upper echelon as a whole.

Ultimately, she found that decapitation was not an effective counter-terrorism strategy. Groups subject to decapitation were in many cases less likely to collapse than those that were not targeted. In particular, as organizations became older and larger, they became less likely to collapse after the removal of their leaders. Religious and separatist groups tended to be more resilient when their leaders were removed than ideological organizations. In regards to the methods of arrest versus assassination, Jordan found that the assassination of the single leader of a group was likely to lead to the collapse of the group. However, the arrest of several members of the upper echelon was more likely to lead to a collapse than their assassination.

Finally, Jordan's paper tested the effect of decapitation strategies on an organization's ability to carry out attacks by examining data on the number of attacks, deaths, and injuries by the FARC, Hamas, and ETA in the two year periods following decapitation strikes against them. The results for ETA were inconsistent; in some cases, violence levels declined after a decapitation, while in others they increased. In the case of Hamas, casualties from attacks declined but the overall number of attacks increased, indicating that the organization remained capable. Lastly, the increases and decreases in FARC activity appeared to be unrelated to the decapitation strikes.

RESEARCH OBJECTIVES

This paper builds on prior research on decapitation strategies by testing whether decapitation strategies targeting the top leadership of terrorist organizations have a consistent and statistically significant effect on the targeted organization's terrorist activity. The study applies statistical analysis to data collected from a publicly available database of terrorist activity in order to ascertain the extent to which terrorist organizations increase or decrease their activities in response to the decapitation strategy.

This approach permits more finely calibrated measures of changes in terrorist activity. The analysis also considers several other factors, including the scale of the organization's activity, long and short-term effects, the effects of a simultaneous crackdown on the targeted

terrorist group, and the effects of the decapitation strategy on terrorist groups with different motivations.

Using data of activity from before and after the decapitation allows us to establish a baseline of group activity during the period prior to the decapitation. By examining terrorist activity levels in the four and ten year periods surrounding the decapitation, the study then tests if the loss of a leader tends to result in 1) rapid disintegration of the targeted group 2) an increase in terrorist activity or 3) a long-term decline over the period of several years.

The inclusion of comparison groups is also useful for a comprehensive study. Terrorist organizations decline and become ineffective for many reasons. Even groups that maintain formidable capabilities over decades may have periods of relative inactivity. Variability in terrorist activity may be an issue inherent to these organizations and therefore an unreliable indicator of the effectiveness of a given policy. Similarly, it may be useful to consider the effect on an organization of a leader's death due to natural causes. Combining these factors provides a clearer and more accurate picture of the ultimate effectiveness (or lack thereof) of the decapitation strategy.

DATA SOURCE: THE TERRORISM KNOWLEDGE BASE

The Terrorism Knowledge Base (TKB - www.tkb.org) is one of the most comprehensive terrorism databases available to the general public. It is based on the RAND Corporation's Terrorism Chronology 1968-1997 and the RAND-MIPT Terrorism Incident database, which covers terrorism events from 1998 to the present. Both databases are based on open source information. TKB, which is maintained by the Memorial Institute for the Prevention of Terrorism (MIPT), a non-profit organization supported by the Department of Homeland Security, permits searches for the total number of terrorism incidents and fatalities by specific groups within specified timeframes – a tremendous asset for this project.

However, TKB has certain limitations. For example, while the database includes 34,079 incidents, 24,051 of these incidents are by unknown or “other” organizations. This is an issue which is unfortunately inherent to the research of terrorism – organizations have incentives to obscure their identity by acting anonymously or blaming events on other organizations. TKB also suffers from problems that are inherent to large databases, such as misclassification.

The RAND Terrorism Chronology database is also problematic in that it only considers international acts of terror, defined as, “Incidents in which terrorists go abroad to strike their targets, select domestic targets associated with a foreign state, or create an international incident by attacking airline passengers, personnel or equipment.” One implication of this method is that large-scale insurgencies may only have a few dozen events in the MIPT database, because most of the insurgent activity was not classified as international terror.

SELECTION CRITERIA & DATA PROBLEMS

As this study is solely concerned with the removal of the top leadership of terrorist organizations, the only events taken into consideration were those that affected either the organization's leader or second in command. Terrorist organizations were selected on the basis of their size. Most of the hundreds of terrorist groups in the MIPT database are very small and have committed fewer than a handful of

actions. Their small size makes their inclusion in the experiment problematic; it also raises questions about their significance as security threats. Most of these groups faded of their own accord or were quickly rounded up by local security services. The rough benchmark for inclusion in this experiment was that a group committed at least 10 terror attacks in its history. In some cases groups that committed fewer terror attacks were included because of the significance of their operations (such as Aum Shinrikyo, one of very few terrorist groups to use WMD).

Selecting comparison groups was also a challenge. The focus was on identifying groups of varying size that had a substantial history of operations from a variety of times and places. The comparison groups were also chosen so as to include a variety of ideologies.

There is no standard measure of terrorist activity. Two statistics are commonly used: fatalities in terror attacks and number of incidents. Unfortunately, there are inherent problems associated with the use of both methods in isolation. Some historically formidable terrorist groups carefully limited the numbers of people they killed, whereas other groups have killed hundreds or thousands in only a few incidents. Alternately, the counting of incidents is not always clear – a series of pipe bombs breaking store windows and 9/11 might both be counted as four incidents, depending on the definition. Furthermore, terrorist attacks in which no one is killed can still have major, even international, repercussions. For example, in 1970 the Popular Front for the Liberation of Palestine (PFLP) hijacked four airliners, thereby dominating international media for much of that summer and sparking a civil war in Jordan where the PFLP was then based.

One other possible measure of terrorist activity is number of injured, but this is also problematic, as injuries are not always carefully recorded. Again, the inclusion of Aum Shinrikyo would skew the results of the study, as its sarin gas attack on the Tokyo subway reportedly resulted in 5000 casualties but about 80% of these “casualties” reported to a hospital in the wake of the attacks and were then sent home.^{vii} To try to capture a fuller picture of terrorist group activity, tests were therefore conducted on both number of terrorism incidents and number killed in terror attacks.

The study compares terrorist activity in the periods before and after the leader’s death or arrest. Comparisons were made between both the two and five year periods prior to and after the event. The two-year period permits a direct comparison to see if the loss of the leader inspired revenge attacks or led to a decline in activity. The five-year period allows the study to take account of longer-term declines or increases in the terrorist organization’s operations. For the comparison groups, dates during which the group was known to be active were selected and data was collected for the two and five year periods before and after this date. Overall, the comparison groups’ dates were selected to ensure that there was a balance in samples from the 35 years covered by the TKB database.

The deaths and killings of terrorist leaders provided clear dates. The arrests were less clear. Arrests for which the leader was released (or escaped) within a few years were not counted. This study only included arrests that led to long-term incarcerations – effectively taking the leader out of the terrorist group’s roster. The date selected was the arrest date because these figures were identified as major terrorist leaders and were generally held under rigorous security conditions. In a few cases, other terrorist groups

killed terrorist leaders. These observations were treated no differently from the other cases of terrorist leaders being killed; the source of the terrorist leader’s death would presumably not change the underlying dynamics of the targeted group.

Additional variables for the terrorist group’s worldview were included in the model. TKB divides terrorist groups into several categories, including religious, nationalist/separatist, and communist/socialist and these categories were added to the model as dummy variables. A variable was also included to reflect the occasions in which the decapitation strike was accompanied by a broader crackdown on the group. Historical data was examined to see if the decapitation strike was part of a broader crackdown on the group, such as mass arrests or the takedown of several other important leaders. For example, in 1989, when the Israeli government arrested Hamas founder Sheikh Yassin, it also arrested dozens of other Hamas members. In contrast, the Israeli missile strike that killed Sheikh Yassin in 2004 was not accompanied by other attacks on Hamas.

Finally, there is the issue of definitions. A comprehensive definition of terrorism has eluded scholars, and may not be possible.^{viii} There is also the distinction between terrorism and insurgency. Because of the paucity of the data, for the purposes of this study organizations included in the MIPT database were considered. These categories include a range of terrorist groups and insurgencies, violent cults, and powerful criminal cartels. Strictly speaking, the subject being tested may be better understood as the effect of decapitation strategies on violent non-state actors.

DATASET DESCRIPTION

The dataset consists of 81 observations, including 21 comparisons and 60 instances of terrorist organizations losing their leaders. Four of these instances were deaths by other causes, 28 were terrorist leaders killed and in 28 cases the terrorist leaders were arrested. An additional 13 groups lost their leaders more than once. A total of 71 terrorist groups are represented in this data set. For eight of the observations within the test population, five years have not elapsed since their leader was removed. These observations are not included in the five-year tests. A complete list of the organizations included in the dataset can be found in Appendix B. A descriptive statistics for the dataset can be found in Appendix C.

THE HYPOTHESES AND THE MODEL

The following hypotheses were tested using a linear regression:

- *Terrorist groups that lose top leaders will have decreased activity, reflected in lower numbers of incidents and killings in the period of time after the event.*
- *Arresting terrorist group leaders will cause greater decreases in terrorist group activity than killing the terrorist group leaders.*
- *Organizations that lose their leader a second time will decline further in activity relative to the comparison group and to groups that lost their leader once.*
- *Religious organizations will be the least affected by decapitation strikes, communist/ideological organizations will be the most affected.*

· *Combining decapitation strikes with broader crackdowns against terrorist groups will lead to sharper declines in terrorist group activity.*

All of these hypotheses were tested using both incidents and fatalities over two and five year periods before and after the decapitation attack.

Because of the very different levels of incidents and fatalities of different terrorist groups, the model performed the tests with an adjustment for the different levels of activity. In the following regression, the model also incorporated the effect of a decapitation strike in conjunction with a general crackdown on the organization:

$$Y = \beta_0 + \beta_1X_{(\text{lose leader}=1)} + \beta_2X_{(\text{total number of incidents})} + \beta_3X_{(\text{crackdown}=1)} + \epsilon$$

where Y represents the difference in incidents between the period before and the period after the leader was killed.

The next regression model included dummy variables for the organization's worldview as well as the factor of a general crackdown accompanying the strike:

$$Y = \beta_0 + \beta_1X_{(\text{lose leader}=1)} + \beta_2X_{(\text{total number of fatalities})} + \beta_3X_{(\text{religious}=1)} + \beta_4X_{(\text{nationalist/separatist}=1)} + \beta_5X_{(\text{communist/socialist}=1)} + \beta_6X_{(\text{crackdown}=1)} + \epsilon$$

where Y represents the difference in fatalities between the periods before and after the terrorist group lost a leader or did not lose a leader.

The study then tested the difference in impact on terrorist group activity of killing vs. arresting a terrorist leader, as demonstrated by the following model:

$$Y = \beta_0 + \beta_1X_{(\text{kill}=1)} + \beta_2X_{(\text{total number of fatalities})} + \beta_3X_{(\text{religious}=1)} + \beta_4X_{(\text{nationalist/separatist}=1)} + \beta_5X_{(\text{communist/socialist}=1)} + \beta_6X_{(\text{crackdown}=1)} + \epsilon$$

where Y is the difference in fatalities between the period before and the period after the terrorist group leader was killed or arrested.

Finally, the following regression model tested the impact of losing a leader for a second time, in comparison to groups that lost their leader only once.

$$Y = \beta_0 + \beta_1X_{(\text{leader lost more than once}=1)} + \beta_2X_{(\text{total number of incidents})} + \beta_3X_{(\text{religious}=1)} + \beta_4X_{(\text{nationalist/separatist}=1)} + \beta_5X_{(\text{communist/socialist}=1)} + \beta_6X_{(\text{crackdown}=1)} + \epsilon$$

where Y is the difference in incidents between the period before and the period after the terrorist group lost a leader more than once or lost its leader only once.

THE RESULTS

Many of the tests conducted in this study did not result in statistically significant outcomes, due to the relative paucity of data on terrorist activity. However, a few tests revealed some possible trends. Full regression results can be found in Appendix A.

Testing the level of decline in incidents in the five years after a decapitation strike shows some indication that decapitation strikes can be effective in reducing terrorist group incidents. The model predicted a decline of approximately 22 incidents. The model also predicted that a decapitation strike combined with a crackdown will typically result in a decline of 28 incidents, although these results are not statistically significant and the R-squared is

low. There were many smaller terrorist groups, such as Action Directe in France, which collapsed after a mass arrest. The ambiguity of this finding may reflect the effect of larger organizations that are responsible for dozens or hundreds of incidents in a year and that may not change their level of activity after a decapitation strike.

In testing the impact of decapitation on the number of people killed by a terrorist group, one strong trend was indicated. The overall fit of the model was only significant at the 10% level with an R-squared of 16%, but there was a strong indication that religious terrorist groups increase their level of deadly violence substantially when subject to decapitation strikes. The other factors in the model were not statistically significant, but the predicted increase by religious terrorists of 56 fatalities was significant at the 10% level. This is reflected by several specific incidents, such as the Egyptian Islamic group's attack on tourists at Luxor after the imprisonment of their spiritual leader Sheikh Rahman, and bloody attacks by Algerian and Chechen terrorists after their leaders were killed. In addition to the revenge factor, killing leaders in the case of large-scale insurgencies like Algeria and Chechnya could lead groups to fragment, perhaps resulting in their replacement by more violent elements.

The tests on the impact of different methods of decapitation strikes (killing vs. arrest) on fatalities in the five year period following the event revealed a related trend. The overall model was significant at a 5% level with an R-squared of 29%. While none of the specific factors were statistically significant, the most statistically significant result indicated an estimated increase of nearly 73 people killed in attacks when the leader of a religious terrorist group was killed rather than arrested. This could indicate that while imprisoned, the leaders of religious groups continue to represent symbols of authority, whereas after they are killed the group tends to fragment.

Another trend may be evident in the change in the number of incidents in the two years after a group has lost its leader for the second or third time as compared to groups losing a leader only once. The overall model is statistically significant. The most significant element within the model is an increase in the number of incidents by religious organizations after they have lost their leader for the second or third time. This may reflect situations in which the strikes take place in the midst of hostilities. One such example would be the assassination of successive Hamas leaders during a period of high activity in the Intifada.

CONCLUSIONS AND FURTHER RESEARCH

Based on this preliminary survey, it is difficult to assess the utility of decapitation strategies. The general decline in incidents when groups are subject to decapitation strikes indicates that this strategy may be useful in certain circumstances. However, the limited effect of the decapitation strategy, particularly on fatal attacks by terrorist groups, raises doubts about its overall efficacy. It is interesting to note that the communist/socialist groups, which other surveys have identified as vulnerable to decapitation strategies, do not show strong indications of vulnerability to decapitation in this study. This may be due to the relatively small dataset or to the declines of smaller ideological terrorist groups being offset by larger and more robust ideological terrorist groups.

The result that consistently stood out from this research was the propensity of decapitation strikes to cause religious

organizations to become substantially more deadly. There are several possible reasons to explain this outcome. Many religious organizations are robust, such as Hezbollah and Hamas, which is an important criterion for surviving the loss of a leader as well as having the resources to strike back. By contrast, some of the nationalist-separatist groups, such as the IRA and ETA, restricted their violence when subjected to the decapitation strategy. Revenge plays a role in the upsurge in deadly violence after a decapitation strike. Another reason might be that the organizations that become more deadly are often in the midst of large-scale insurgencies; the death of the leader is therefore a component in causing the insurgency to enter a more deadly phase. Another explanation might be that during periods of extreme violence in which leaders are likely to be removed, the most violent elements within a religious terrorist group will also rise to the fore.

The indication that killing religious organization's leaders rather than arresting them is more likely to lead to a surge of deadly violence may be worth further exploration. An imprisoned religious leader may continue to be a source of authority that prevents a new leader from taking charge. In addition, some imprisoned leaders, either in the hopes of gaining clemency or due to true changes of heart, have renounced violence.

Based on this data, decapitation strikes are not a silver bullet against terrorist organizations. In the case of religious groups, they may even be counter-productive. However, since the most violent religious organizations operate on a large-scale and have extensive bases of support among the population, comparing these organizations to the relatively small terrorist radicals in Europe during the Cold War may not be appropriate. Different organizations may have different vulnerabilities to decapitation. Small self-starting Islamist terror cells may be more akin to the European radical groups and more

vulnerable to decapitations and crackdowns. Another question to explore is how decapitation strikes work in conjunction with other counter-terror strategies, such as fomenting internal dissent, addressing terrorist group grievances, and attacking the terrorist group's support base. Several of the examples of killed terrorist group leaders included in this study were actually killed by other terrorists. If more data were present, this would be an interesting direction in which to conduct further research.

Ultimately, in order to better understand the impact of decapitation strikes, more data is necessary. Over 20,000 of the incidents in the MIPT database are not assigned to a terrorist group – which is more than double the number that are currently assigned to terrorist groups. Culling this dataset and examining other publicly available datasets^{ix} may help reveal other terrorist groups that could be included in this study. At the same time, applying this data to the groups already in this project would provide a fuller picture of the activity of the groups already in the dataset.

Tolstoy began *Anna Karenina* by noting, "Happy families are all alike, every unhappy family is unhappy in its own way." Like unhappy families, terrorist groups differ from each other and finding universally applicable rules to understand them may not be realistic. Regardless of the quantitative results, decapitation will remain a counter-terror strategy. If a quantitative test can help indicate where and when it is most likely to be effective or have deleterious results, it can help to conserve scarce counter-terror resources and avoid exacerbating situations where the decapitation strategy may be counter-productive.

Appendix A: Regression Results

Table 1

Linear Regression Results for the Change in Terrorist Group Incidents in the 5 year period before and 5 year period after a leader was lost (After Lose Leader – Before Lose Leader)

	Change in 5-year Incidents	
	Coefficient (s.e.)	p-value
Intercept	15.6 (9.9)	0.12
Lose Leader (Y/N)	-16.7 (12.5)	0.19
Total Incidents	0.06 (0.04)	0.13
Crackdown (Y/N)	-12.0 (12.5)	0.34
R-Square	0.10	
Overall Model p-value	0.075*	

* Statistically Significant at the 0.10 level

$$Y = \beta_0 + \beta_1X_{(lose\ leader=1)} + \beta_2X_{(total\ number\ of\ incidents)} + \beta_3X_{(crackdown=1)} + \varepsilon$$

Y is the difference in incidents between the 5 year period before and 5 year period after the terrorist group lost a leader or did not lose its leader.

ε is the error term.

The model above had 47 groups who lost their leader and 21 groups who did not lose their leader.

Table 2

Linear Regression Results for the Change in Terrorist Group Fatalities in the 5 year period before and 5 year period after a leader was lost (After Lose Leader – Before Lose Leader)

	Change in 5-year Fatalities	
	Coefficient (s.e.)	p-value
Intercept	-2.7 (25.1)	0.91
Lose Leader (Y/N)	24.3 (26.3)	0.36
Total Fatalities	0.07 (0.05)	0.22
Religious (Y/N)	56.0 (30.7)	0.07*
Nationalist/Separatist (Y/N)	-26.4 (23.5)	0.26
Communist/Socialist (Y/N)	0.46 (25.5)	0.99
Crackdown (Y/N)	-36.8 (26.2)	0.17
R-Square	0.16	
Overall Model p-value	0.099*	

* Statistically Significant at the 0.10 level

$$Y = \beta_0 + \beta_1X_{(lose\ leader=1)} + \beta_2X_{(total\ number\ of\ fatalities)} + \beta_3X_{(religious=1)} + \beta_4X_{(nationalist/separatist=1)} + \beta_5X_{(communist/socialist=1)} + \beta_6X_{(crackdown=1)} + \varepsilon$$

Y is the difference in fatalities between the 5 year period before and 5 year period after the terrorist group lost a leader or did not lose its leader.

ε is the error term.

The model above had 47 groups who lost their leader and 21 groups who did not lose their leader.

Notes on Tables 1 & 2: The Comparison group has 21 observations and the Treatment group has 47 observations. A total of 68 groups were used in the 5-year test because some of the observations had occurred within the past 5 years so complete data was unavailable. There were several observations in which a terrorist organization had its leader removed more than once. To avoid multi-co-linearity only the first loss was counted as an observation in this calculation.

Table 3

Linear Regression Results for the Change in Fatalities Between the 5 year period before and 5 year period after a Leader was Killed or Arrested (After Kill/Arrest Leader – Before Kill/Arrest Leader)

	Change in 5-year Fatalities	
	Coefficient (s.e.)	p-value
Intercept	43.5 (52.6)	0.41
Kill vs Arrest Leader (kill=1)	-22.0 (38.6)	0.58
Total Fatalities	0.12 (0.08)	0.15
Religious (Y/N)	73.0 (44.6)	0.11
Nationalist/Separatist (Y/N)	-35.9 (34.8)	0.31
Communist/Socialist (Y/N)	-11.0 (39.1)	0.78
Crackdown (Y/N)	-52.8 (38.1)	0.17
R-Square	0.29	
Overall Model p-value	0.041*	

* Statistically Significant at the 0.05 level

The model above had 20 groups whose leader was killed and 23 groups whose leader was arrested.

$$Y = \beta_0 + \beta_1 X_{(kill=1)} + \beta_2 X_{(total\ number\ of\ fatalities)} + \beta_3 X_{(religious=1)} + \beta_4 X_{(nationalist/separatist=1)} + \beta_5 X_{(communist/socialist=1)} + \beta_6 X_{(crackdown=1)} + \epsilon$$

Y is the difference in fatalities between the period before and the period after the terrorist group leader was killed or arrested.

ε is the error term.

Notes on Table 3: The Comparison group of organizations that had their leader arrested had 23 observations; the Treatment group of organizations that had their leader killed had 20 observations. To avoid multi-co-linearity only the first loss was counted as an observation in this calculation.

Table 4

Linear Regression Results for the Change in Incidents Between the 2 year period before and 2 year period after lost leader more than once or once (After Lost Leader More Than Once/Once – Before Lost Leader More Than Once/Once)

	Change in 2-year Incidents	
	Coefficient (s.e.)	p-value
Intercept	-13.6 (13.4)	0.32
Lost Leader More than Once/Once (More than once=1)	-2.7 (11.6)	0.82
Total Incidents	0.25 (0.05)	< 0.001*
Religious (Y/N)	17.0 (12.4)	0.18
Nationalist/Separatist (Y/N)	-11.1 (11.2)	0.33
Communist/Socialist (Y/N)	-0.03 (12.1)	0.99
Crackdown (Y/N)	1.9 (10.2)	0.86
R-Square	0.47	
Overall Model p-value	< 0.001*	

* Statistically Significant at the 0.01 level

$$Y = \beta_0 + \beta_1 X_{(leader\ lost\ more\ than\ once=1)} + \beta_2 X_{(total\ number\ of\ incidents)} + \beta_3 X_{(religious=1)} + \beta_4 X_{(nationalist/separatist=1)} + \beta_5 X_{(communist/socialist=1)} + \beta_6 X_{(crackdown=1)} + \epsilon$$

Y is the difference in incidents between the 2 year period before and 2 year period after the terrorist group lost a leader more than once or lost its leader only once.

ε is the error term.

The model above had 13 groups who lost their leader more than once and 37 groups who lost their leader once.

Notes on Table 4: The Comparison group, of organizations that lost their leader once had 37 observations; the Treatment group of organizations that lost their leader more than once had 13 observations. To avoid multi-co-linearity only the last loss was counted as an observation in this calculation.

Appendix B

Terrorist Groups Included in This Survey

Abu Nidal Organization (Fatah Revolutionary Council)	Jemaah Islamiya
Armenian Secret Army for the Liberation of Armenia (ASALA)^	Justice Commandos for Armenian Genocide*
Abu Sayyaf^	Kach
Action Directe	Liberation Tigers of Tamil Eelam*
All Tripura Tiger Force*	Lashkar-e-Jhangvi^
Amal	Lautaro Youth Movement
April 19 Movement^	Lebanese Armed Revolutionary Faction
Armed Islamic Group^	MEK*
Aum Shinrikyo	Moro Islamic Liberation Front
Baader-Meinhof	Montoneros
Basque Fatherland and Freedom^	Moro National Liberation Front
Breton Revolutionary Army	New People's Army*
Charles Martel Group*	November 17th
Che Guevara Brigade*	Popular Front for the Liberation of Palestine
Chechens	Popular Front for the Liberation of Palestine-General Command*
Communist Combatant Cells	Kurdistan Worker's Party (PKK)
Communist Party of Nepal*	Palestinian Islamic Jihad
Democratic Front for the Liberation of Palestine*	Palestinian Revolutionary Forces - General Command*
Dev Sol	People's Revolutionary Army (Argentina)
ELF*	Polisario*
FARC*	Popular Forces of April 25
Fronte di Liberazione Nazunale di a Corsica (FLNC)	Real IRA
FMLN*	Red Army Faction*
FPMR	Red Brigades^
First of October Antifascist Resistance Group (GRAPO)^	Revolutionary Nuclei*
Guerilla Army of the Poor*	Revolutionary People's Struggle
Hamas^	Salafist Group for Preaching and Combat
Hezbollah	Shining Path^
Irish Republican Army (IRA)*	Tigray People's Liberation Front*
Irish National Liberation Army^	Tupac Amaru Revolutionary Movement^
Islamic Great Eastern Raiders Front	Tupamaros
Jewish Defense League (JDL)	UDA
Jaish e Mohammed*	ULFA
Japanese Red Army	UNITA
	al-Fatah^
	al-Gama'a al-Islamiyya

* Comparison Group that did not lose leader

^ Lost multiple leaders

Table 1
Descriptive Statistics for Dataset Used to Compare the Groups "Lost Leader" or "Has Leader"

		Mean (Standard Deviation)			
		Change in 5-yr Incidents	Total Incidents	Change in 5-yr Fatalities	Total Fatalities
Overall (N=68)		5.4 (43.9)	82.8 (130.3)	10.5 (87.8)	114.9 (210.2)
Lost (n=47)	Leader	-1.5 (27.3)	80.5 (116.5)	15.9 (99.7)	120.0 (214.5)
Has (n=21)	Leader	21.0 (66.2)	87.8 (160.0)	-1.7 (52.4)	103.4 (204.8)

Table 2
Descriptive Statistics for Dataset Used to Compare the Groups "Leader Killed" or "Leader Arrested"

		Mean (Standard Deviation)	
		Change in 5-yr Fatalities	Total Fatalities
Overall (N=43)		19.0 (102.7)	127.1 (222.8)
Leader Killed (n=20)		34.4 (146.4)	208.0 (279.6)
Leader Arrested (n=23)		5.6 (34.8)	56.8 (127.0)

Table 3
Descriptive Statistics for Dataset Used to Compare the Groups "Lost Leader more than once" or "Lost Leader once"

		Mean (Standard Deviation)	
		Change in 2-yr Incidents	Total Incidents
Overall (N=50)		6.5 (40.9)	79.8 (114.0)
Lost Leader more than once (n=13)		20.5 (78.6)	151.8 (186.8)
Lost Leader once (n=37)		1.6 (10.3)	54.5 (59.4)

ENDNOTES

ⁱ Audrey Kurth Cronin, "How al-Qaida Ends: The Decline and Demise of Terrorist Groups," *International Security*, Vol. 31, No. 1 (Summer 2006), pp. 7-48.

ⁱⁱ George W. Bush, "National Security Strategy for Combating Terrorism," (The White House, 2003)

ⁱⁱⁱ Mohammed M. Hafez & Joseph M. Hatfield, "Do Targeted Assassinations Work? A Multivariate Analysis of Israel's Controversial Tactic during Al-Aqsa Uprising," *Studies in Conflict & Terrorism*, Vol. 29, No. 4 (June 2006), pp. 359-382.

^{iv} Daniel Byman, "Do Targeted Killings Work," *Foreign Affairs*, Vol. 85, No. 2 (March-April 2006), pp. 95-112.

^v Gary LaFree & Laura Dugan, "Efficacy of Counterterrorism Approaches: Examining Northern Ireland," *Research Brief*, National Consortium for the Study of Terrorism and Responses to Terrorism, October 2006

^{vi} Jenna Jordan, "Leadership Decapitation of Terrorist Organizations, Paper presented at the annual meeting of the International Studies Association, Montreal, Quebec, March 17, 2004.

^{vii} Amy Smithson, *Ataxia: The Chemical and Biological Terrorism Threat and US Response*, Chapter 3 Rethinking the Lessons of Tokyo, Stimson Center Report No. 35.

^{viii} Walter Laqueur, *No End to War: Terrorism in the Twenty-First Century*, (New York: Continuum, 2003) pp. 232-238.

^{ix} The National Consortium for the Study of Terrorism and Responses to Terrorism at the University of Maryland maintains the Global Terrorism Database with nearly 80,000 events.