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Do Drone Strikes Degrade Al Qaeda? Evidence From Propaganda Output

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*The United States has used unmanned, aerial vehicles—drones—to launch attacks on
militants associated with Al Qaeda and other violent groups based in Pakistan. The
goal is to degrade the target's capacity to undertake political and violent action. We
assess the effectiveness of drone strikes in achieving this goal, measuring degradation
as the capacity of Al Qaeda to generate and disseminate propaganda. Propaganda is
a key output of many terrorist organizations and a long-standing priority for Al
Qaeda. Unlike other potential measures of terrorist group activity and capacity,
propaganda output can be observed and measured. If drone strikes have degraded
Al Qaeda, their occurrence should be correlated with a reduction in the organization's
propaganda output. The analysis presented here finds little evidence that this is the
case. Drone strikes have not impaired Al Qaeda's ability to generate propaganda.*

Keywords propaganda, targeted killings, terrorism, unmanned aerial vehicles
(UAVs)

Introduction

An important goal of United States foreign policy is to disrupt and defeat the central
Al Qaeda organization that operates along the Afghan/Pakistani border. This is dif-
ficult because the government of Pakistan will not allow United States military forces
to operate in the country. The United States has pursued a policy that allows for the
targeted killings of senior Al Qaeda leaders with drone strikes. Drones are remotely
piloted unmanned aerial vehicles (UAVs) equipped with surveillance technology and
accurate missiles that are able to loiter over terrorist and insurgent strongholds for
long periods to identify and strike targets. Drone strikes were rarely undertaken as
recently as 2006, but have become the key component of American counterterrorist
efforts in the region, and have since been used in other countries as well.

This article seeks to evaluate the effectiveness of the drone strike campaign in
reducing Al Qaeda's propaganda output. The drone strike policy is grounded in
the belief that strikes interfere with the terrorist organization's capacity to operate.
Drones provide a seemingly low-risk means of collecting intelligence, identifying
targets, and launching attacks. Supporters of this perspective note that the drone
strike program has been invaluable in eliminating the leadership of Al Qaeda and
other organizations, crippling their ability to function. Leon Panetta, the former

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director of the United States Central Intelligence Agency, concluded that, "[t]hose operations are seriously disrupting al-Qaeda. ... It's pretty clear from all the intelligence we are getting that they are having a very difficult time putting together any kind of command and control, that they are scrambling. And that we really do have them on the run."[1] Critics argue that drone strikes might instead strengthen Al Qaeda. They provide the terrorist organization with powerful grievances against the United States, and narratives of United States cruelty that can be utilized to win the support of the local population, to garner resources, and to recruit supporters and militants.

    This article undertakes an empirical investigation of the relationship between drone strikes and Al Qaeda propaganda output. We analyze propaganda output for two reasons. First, producing effective propaganda is an important objective of most terrorist groups, including Al Qaeda. The group's most senior leaders have repeatedly emphasized this point. Osama bin Laden stated that "the media war of this century is one of the strongest methods" of terrorism, and his deputy Ayman al-Zawahiri claimed that "we are in a battle, and more than half of this battle is taking place in the battlefield of the media."[2] Second, propaganda output is a proxy for Al Qaeda's capacity to organize political action that can be observed and measured. This is not the case for many other types of terrorist group activity, such as the ability to raise funds or to attract recruits. We employ regression analysis based on weekly data measuring the occurrence of drone strikes, the incidence of propaganda output, and the duration of propaganda produced by Al Qaeda from January 2006 through November 2011. The evidence leads to the conclusion that drone strikes have not been effective in reducing Al Qaeda's propaganda output. From the perspective of its ability to generate propaganda, Al Qaeda appears to be resilient to the threat of drone strikes. In the concluding section, we discuss the policy implications and potential limits of this analysis.

Do Targeted Killings Degrade Terrorist Organizations?

"Drones" are unmanned aerial vehicles (UAVs). They are capable of loitering over conflict areas for extended periods of time, allowing pilots who might be stationed far from the scene of the conflict to gather real-time intelligence with communications and video sensors. Some drones, such as the RQ1 Predator that has been utilized by the United States in Afghanistan, Pakistan, and other conflict areas, are armed with air-to-ground missiles. Drone strikes are a form of targeted killings, defined as the intentional killing of "a specific civilian or unlawful combatant who cannot reasonably be apprehended, who is taking a direct part in hostilities, the targeting done at the direction of the state, in the context of an international or non-international armed conflict."[3] The United States has used armed drones to target leaders and militants affiliated with Al Qaeda and other groups who are based in northwestern Pakistan. Drone strikes have become a crucial component of United States anti-insurgent campaigns, as the Pakistani government does not permit the United States to use ground forces in the country.[4] Drone strikes allow the United States to continue operating in a less politically sensitive and less intrusive manner than traditional forms of warfare, such as ground troops. Proponents of the program insist that the strikes have dealt irreparable damage to Al Qaeda, killing hundreds of militants, and dozens of high-ranking targets. They hold that drone strikes have important advantages over more traditional forms of warfare. The unmanned vehicles allow the United States to operate without putting pilots and support personnel at risk.

The drone's abilities to loiter and to collect multiple streams of intelligence allow for more careful targeting and result in the death and injury of fewer non-combatants. Each drone mission involves around 180 individuals who pilot the aircraft remotely, analyze intelligence from its sensors and integrate this with intelligence from other sources, estimate if civilians might be harmed in an attack, and make decisions to launch the drone's missiles.[5]

There is considerable debate in the academic literature about the effectiveness of targeted killings in disrupting terrorist and insurgent organizations. Hafez and Hatfield find that targeted killings had no effect on subsequent terrorist attacks by Palestinian groups.[6] An analysis by Jaeger and Paserman finds that targeted killings correlate with fewer suicide bombing deaths and decrease Palestinian terrorist groups' interest in launching attacks.[7] Jordan holds that targeted killings can lead to the collapse of smaller, less established organizations whose grievances are not grounded in religion, but that targeted killings are ineffective and sometimes counter-productive in other cases.[8]

Most of these studies measure the outcome of interest, the disruption of a targeted group, and its ability to engage in continued violence. Hafez and Hatfield and Jaeger and Paserman, for example, use as their dependent variables the number of terrorist attacks launched by Palestinian groups against Israeli targets. Terrorist and insurgent violence is, of course, an important measure of a group's political and military capacity. It may not be an ideal measure of disruption in the case of Al Qaeda. Al Qaeda does not always claim credit for acts of violence that it commits. It also operates in a region with a great deal of political violence, including terrorist attacks directed against civilians and insurgent attacks on Pakistani, Afghan, and international military forces. This makes it difficult to determine if a particular attack should be attributed to Al Qaeda. There is an active debate about the relative strength and role Al Qaeda plays in directly planning, organizing, and carrying out acts of violence throughout the world. Sageman argues that "al Qaeda Central," the base of the terrorist organization network in Pakistan, is no longer primarily concerned with actively planning attacks overseas. Rather, the main threat to the West is grassroots terrorist "wannabes" who have been enabled by the Internet— and it is Al Qaeda's new operational purpose to inspire these individuals and smaller homegrown terrorist groups to action.[9] Hoffman holds that homegrown terrorist organizations are largely a "myth," and that Al Qaeda Central remains active in planning attacks. However, Hoffman also notes that this does not mean that Al Qaeda Central directly carries out many acts of violence. It frequently works through intermediaries and affiliates in south Asia and other parts of the world who undertake most of the tactical planning and organizing of attacks.[10]

Another reason why terrorist or insurgent violence is not the only reasonable measure of a group's capacity is that the effects of targeted killings on terrorist or insurgent violence may operate with a lag. This lag is likely to be considerable for organizations that are not organized in a strict hierarchy. Terrorist groups that are hierarchically organized are more vulnerable to targeted killings that eliminate individuals at the top of the chain of command. Many terrorist and insurgent groups adopt decentralized or networked forms of organization to minimize this vulnerability. This means that the targeted killing of one leader is unlikely to have an immediate effect on the organization's capacity to act. Al Qaeda is one group that has adopted a less hierarchical form of organization.[11] This means that it may take many strikes against many targets for the drone campaign to have a discernable effect on the organization's ability to engage in violence.

An alternative and complementary way to assess the disruption of a militant group would be to measure changes in its internal activities and organizational characteristics. Financial flows, recruitment patterns, personnel turnover, planning activities, and so on would all be useful ways to measure any effects of targeted killings. But militant groups seek to shield such information from outsiders, since it could provide their foes with intelligence that is useful in attacking the group. We focus on the propaganda output of Al Qaeda as a measure of disruption. Propaganda output is necessarily public information, since it is meant to be communicated widely outside of the group that produces it. As discussed below, propaganda is a central function of Al Qaeda, so it should be vulnerable to the effects of drone strikes. If drones have been effective in disrupting the internal organization and activities of Al Qaeda, we should be able to observe this in changes in the group's propaganda output.

Propaganda and Terrorism

An important goal of many terrorist organizations, including Al Qaeda, is to attract the attention of decision-makers and the public through acts of violence.[12] Terrorist organizations are weak and lack the resources needed to wage traditional warfare against their foes. Because they cannot defeat their opponents directly in battle, terrorist organizations turn to indirect strategies to achieve their objectives. Terrorism differs from traditional forms of warfare in that its underlying goal is to leverage the effects of violence on a mass audience as "substitutes for much more costly organizational, military, and other methods of capturing attention or controlling minds."[13] The news media reports the effects of terrorist acts to extend beyond the narrow confines of the victims and their families, influencing a mass audience, and giving the terrorist group an expanded platform on which to advocate for their political stances.[14] Nacos terms this "mass-mediated terrorism," and suggests that terrorists calculate the consequences of their actions not only in the number of lives lost or the economic and social damage inflicted, but in the amount of media attention they are able to garner.[15] "Terrorism is a theater," Jenkins declared,[16] and Weimann and Winn—in their discussion of terrorist organizations' reliance on mass media—consolidated that powerful image into the metaphor of the "theatre of terror."[17] This metaphor acknowledges the inherently embellished, calculated, and theatrical nature of modern terrorist activity, leading to Weimann's conclusion that terrorism involves not only violence but also "script preparation, cast selection, sets, props, role-playing, and minute-by-minute stage management. Just like compelling stage plays or ballet performances, the media orientation in terrorism requires full attention to detail to be effective."[18]

The propaganda issued by the terrorist organization itself plays an important role in reaching and influencing a mass audience. This propaganda "empowers these movements with the ability to shape and disseminate these [political] messages in their own way, enabling them to completely bypass traditional, established media outlets."[19] The advent of and spread of access to less expensive production technology and dissemination via the Internet makes it possible for some terrorist organizations to directly influence audience members, in addition to seeking to have their propaganda and actions discussed by the mainstream media.[20] This propaganda can be didactic (designed to educate and solicit support), can be a medium for recruitment, can be deliberately threatening or coercive, or can be internally directed to strengthen morale within the organization.

Al Qaeda has been particularly adept at developing their propaganda branch, as-Sahab Media. As-Sahab's goal is to produce strategic propaganda that legitimizes and propagates Al Qaeda's mission, builds rapport with their targeted audience while intimidating a greater international audience, and undermines the goals of the United States. This allows the terrorist organization to recruit new members, curry political favor with sympathetic civilians and governments, and garner resources from those it can convince its cause is righteous. As-Sahab—"The Cloud"—includes camera operators, editors, technicians, and distributors. Many productions follow Al Qaeda personalities to remote locations in Afghanistan and Pakistan to capture video and audio statements for official release. Others include footage of combat in Afghanistan. As-Sahab's production process is sophisticated and covert. Following the initial filming, the raw footage is edited and receives graphics, subtitles, and backgrounds, among other revisions. The finished product is then uploaded onto various websites, beginning a chain of further distribution by sympathizers. This allows as-Sahab to bypass traditional media outlets and air its message unadulterated. As-Sahab's propaganda output is high quality—displaying uniform logos and features such as digitally added subtitles—indicating that they have access to modern equipment, low-end professional hardware, and adept editors and technicians.[21]

Like other terrorist groups with propaganda arms, as-Sahab has exploited the dramatic decrease in the cost and complexity of producing and distributing videos made possible by the miniaturization of camera technology, widespread availability of editing software, and online channels for distribution. These new technologies mean that as-Sahab can produce propaganda with fewer and smaller fixed facilities than would have been possible even a decade ago. This makes it less vulnerable to drone strikes. A central assumption of this paper is that this reduced vulnerability does not make the group *invulnerable* to the effects of drone strikes. Propaganda is a central function of Al Qaeda, and the leadership of the organization is likely to be closely involved in providing the propaganda arm with strategic direction. These leaders frequently appear in the group's media productions. They are also the principal targets of the drone strikes. If the drone strikes kill them or interfere with their ability to travel or communicate, this could result in a reduction in propaganda output. As-Sahab frequently portrays leaders killed by drone strikes as martyrs. This practice could produce a positive correlation between drone strikes that kill leaders and propaganda output. This positive effect is likely to be limited in size, however, since Al Qaeda has only a limited number of leaders that can be portrayed as martyrs.

Drone Strikes and Propaganda

This discussion suggests two competing hypotheses for how drone strikes might impact Al Qaeda's propaganda output. The first suggests that drone strikes might make it more difficult for terrorists to produce organized media, leading to less propaganda output and shorter duration of propaganda. While numerous news media reports hint at the effectiveness of drone strikes in decreasing Al Qaeda's propaganda output—suggesting that the deaths of operational commanders have dealt crippling blows to the organization—no empirical studies assessing the direct impact of drone strikes on terrorist organizations' propaganda output exist in the current literature.[22]

The United States drone strike campaign is grounded in this notion that targeted killings reduce the ability of terrorist organizations to operate. This should impair their

ability to produce propaganda as a symptom of their overall decreased operational capacity. From this perspective, drone strikes undermine terrorist organizations' abilities to effectively organize at filming or recording sites, transport raw footage, gain access to the resources and individuals needed to produce a polished finished product, and disseminate that product via the Internet. Because the drone strike campaign primarily targets the leaders of Al Qaeda, it weakens as-Sahab's production capacity by eliminating the potentially influential "stars" of its videos. Further, if the development of propaganda is coordinated by Al Qaeda's leadership, eliminating leaders should reduce the quality, quantity, and frequency of propaganda issuances. Finally, drone strikes interfere with many of the operational details required to produce and transport a sophisticated piece of media. Strikes force frequent movement of the production group, foster internal suspicions and divisions, and force organizations to cut down on communications or use less efficient means of communicating.

Critics of the drone strike campaign assert that these targeted killings might actually foster increased terrorist activity, including propaganda output. Kilcullen and Exum argue that, because of the drone strike campaign, the United States has lost the support of the Pakistani civilian population. "While violent extremists may be unpopular, for a frightened population they seem less ominous than a faceless enemy that wages war from afar and often kills more civilians than militants."[23] The persistence of drone strikes on Pakistani territory, according to their analysis, has offended the Pakistani people, alienated them from their government and from the United States, and contributed to the nation's instability. Drone strikes provide as-Sahab with incidences of United States behavior that can be painted as cruel, brutal, and capricious to a mass audience, further legitimizing the political stances of Al Qaeda.

Moreover, there is a great deal of debate about the accuracy of the drone strikes.[24] Some analyses hold that the drones are increasingly accurate, and that a large majority of those killed and injured in drone strikes are militants and leaders. Others conclude that the number of non-combatants killed by drones is much larger.[25] Non-combatant deaths have been the greatest criticism of the campaign, and have led to growing discontent within the Pakistani public. Critics argue that as-Sahab can easily and adeptly transform leaders and civilians slain by drones into martyrs for its cause, using their deaths to condemn the United States and the Western world as an unjust, unsympathetic, and inhumane bully. Al Qaeda has exploited this possibility by releasing numerous public statements asserting that the United States exploits its unfair advantage in technology and that the use of unarmed drones is cowardly. Walsh and Piazza find that indiscriminate violence by authorities—much like the kind that Al Qaeda alleges is inherent in the drone strike campaign—fosters more terrorism.[26] Such violence against civilians is regularly emphasized by the Taliban and al Qaeda in propaganda productions.[27] Drone strikes also provide Al Qaeda with a more direct opportunity to recruit new members and garner the financing, resources, and popular support it needs to continue operating. By emphasizing civilian deaths, as-Sahab can use the victims as evidence that the United States cares little for the welfare of the Afghan and Pakistani peoples.

Alternatively, these two hypotheses may both capture part of the relationship between drone strikes and propaganda output. It is possible that drone strikes increase propaganda output in the week or weeks immediately after they occur, but then decrease output in subsequent weeks. This might be the case if Al Qaeda deliberately responds to strikes with greater propaganda output to demonstrate its

resilience, but over the longer run actually is degraded and unable to maintain this pace of propaganda production. Alternatively, drone strikes might weaken Al Qaeda in the short run. But by inciting grievances against the United States, drone strikes could lead more individuals to support Al Qaeda, providing it with the capacity to produce more propaganda weeks and months after a drone strike. In the empirical investigation below, we investigate this possibility by including lags of drone strikes for up to thirty weeks on our regression models. If this variant accurately describes the relationship between drone strikes and propaganda output, we would expect to see negative and statistically significant coefficients on drone strikes that are lagged fewer weeks, and positive and significant coefficients on longer lags of drone strikes.

Data, Methodology, and Results

The measures of propaganda output used in this analysis are gathered from the database of Al Qaeda messages and propaganda maintained by IntelCenter.[28] The IntelCenter data covers any statements and other public or semi-public media communications issued by Al Qaeda through its formal outlet, as-Sahab Media, and related dissemination channels. The IntelCenter data also includes propaganda produced by groups related to Al Qaeda, such as Al Qaeda in the Arabian Peninsula. We do not include propaganda produced by such groups in the data analysis, since it is unlikely to be directly influenced by drone strikes. The measures of propaganda output include only propaganda produced by Al Qaeda Central; when the link to Al Qaeda Central is not clear from the data source, we exclude a propaganda release from our dataset. IntelCenter lists the release date, the recording date, and the production date for each communication. We use the release date to document when the communication was issued. The release date is the day the communication is marked to be aired by the media or the day it goes into release on the Internet. The release date is available for most entries. It is also the most significant date when assessing the motives of as-Sahab in releasing a communication. The air date can be anywhere from weeks to months after the production date when Al Qaeda finished the complete product. While using the production date would provide us with a stronger measure of the impact of drone strikes on Al Qaeda's ability to produce propaganda, that information is only occasionally self-disclosed by Al Qaeda on its productions, and is thus not regularly available enough for any systematic study. IntelCenter identifies a total of 343 Al Qaeda propaganda communications during the time period considered here—January 2006 through November 2011. The start date of 2006 was chosen because there were only 2 drone strikes in 2006 and 4 in 2007. The incidence of drone strikes drastically increased to 32 in 2008, 53 in 2009, 118 in 2010, and then dropped to 55 from January through November 2011. This timeframe is optimal because it allows us to contrast a time period with relatively few strikes (2006–2007) to a time period of frequent strikes (2008–2011). This variation allows us to draw conclusions about the effects of drone strikes for each period. The end date of November 2011 was chosen because it is the latest full month of propaganda output data reported by IntelCenter.

The key independent variable in the study is a count of drone strikes. The source for data on drone strikes is Bergen and Tiedemann.[29] This source provides a reliable measure of drone strikes, as it includes only "accounts from reliable media organizations with substantial reporting capabilities in Pakistan" that "cover the drone strikes as accurately and aggressively as possible." These include reputable and United

States-based news outlets such as *The New York Times* and *The Washington Post*; major news services including BBC, Reuters, and the Associated Press; and reputable English-language newspapers and an independent television network within Pakistan. Drone strikes target leaders of Al Qaeda Central as well as members of related groups, such as the "Pakistan Taliban," that have their own media and propaganda arms. Ideally, the dataset would include only strikes that target Al Qaeda Central. The source for the data does not allow one to reliably distinguish the targets of attacks with sufficient detail to allow this. Thus the dataset includes all drone strikes, including those that may not have been targeted at Al Qaeda Central. It is possible that the results reported below would be unchanged if we did have access to the intended targets of each drone strike. The reason for this is that Al Qaeda Central and other targets of drone strikes frequently collaborate and discuss attacks on each other in their own propaganda.

Table 1 summarizes the number of drone strikes and the amount of propaganda output per year (note that the data for 2011 are limited to January through November). There is not a straightforward relationship between the two variables. Drone strikes increase substantially in the second half of 2008 and continue to increase through 2010. Propaganda is stable in 2007 and 2008, increases sharply in 2009, and then drops in 2010 and again in 2011. The general increase in propaganda output in 2009 is consistent with the argument that Al Qaeda responds to drone strikes by producing more propaganda, while the decrease in propaganda output in 2010 and 2011 accords with the claim that drone strikes during this period disrupted the organization's ability to communicate. Table 1 also does not address two other issues. It cannot account for a potential lag between any effect of drone strikes on propaganda output. As discussed above, it is possible that the effect of drone strikes would not operate immediately. If drone strikes degrade Al Qaeda's ability to produce and disseminate communications, this process would involve multiple drone strikes over a period of weeks or months. Second, the bivariate relationship depicted in Table 1 cannot account for other potential influences on Al Qaeda's ability and willingness to produce propaganda. We next undertake a multivariate statistical analysis that allows us to account for these two factors.

The multivariate analysis controls for other conflict-related events and developments that might influence the production capabilities of Al Qaeda or their willingness to release propaganda. During the period over which we analyze the available data, the Pakistani military undertook four large-scale military efforts against northern and western insurgent groups—the Zalzala Offensive (January through May 2008), the Sher Dil Offensive (September 23 through October 2008), the Rah-e-Nijat Offensive (October 2 through December 12, 2009), and the Orakzai and Kurram Offensives

Table 1. Drone strikes and Al Qaeda propaganda output, 2006–2011

Year	Number of drone strikes	Al Qaeda propaganda output
2006	2	935
2007	4	1528
2008	32	1414
2009	53	2830
2010	118	1725
2011	55	1077

(March 23 through June 3, 2010). Lacking reliable empirical data on the intensity of each offensive, they are measured as dummy variables, taking a value of one during the period during which they occurred and a value of zero otherwise. Similarly, this study controls for the Malakand Accord, which occurred from February to April 2009, during which the Pakistani government withdrew troops from the Swat Valley.[30] It is included as a dummy variable that takes a value of one during this period and a value of zero otherwise. The "surge" in 2009 and 2010 of international troops in Afghanistan is also accounted for as a potential influence on propaganda activity. Since the United States accounts for most of those new troops, the number of active-duty United States military personnel (including National Guard and Reserves) is included as a variable. This data was obtained from the Personnel and Procurement Reports published by the Department of Defense.[31] We also account for elections in Afghanistan and Pakistan. This is particularly important because the increased political activity surrounding elections could affect terrorist organizations' propaganda production in a number of ways. First, it could increase propaganda output by re-energizing Al Qaeda and providing them an opportunity to capture global media attention while it is focused on the region. Second, it could decrease propaganda output as Al Qaeda's resources are devoted elsewhere in leveraging the elections for political gain. We employ a dummy variable for periods leading up to national elections in both Pakistan and Afghanistan. For Pakistan, this period spans from December 15, 2007 (the lifting of emergency military rule) until February 19, 2008 (the date of parliamentary elections); for Afghanistan, it spans from June 20, 2009 until August 20, 2009, accounting for a two-month period preceding the presidential election, and a similar span for the parliamentary elections in 2010. The last control variable assesses the influence of the killing of Osama bin Laden in 2011 on propaganda output. This event may have increased propaganda output as the remaining leadership sought to respond to supporters about the implications of bin Laden's death. Alternatively, it may decrease propaganda output as the organization worked out a transition to new leadership. The dichotomous variable measuring this takes a value of zero in periods prior to bin Laden's death and a value of one after his death.

Table 2 presents the results of the multivariate analysis. The model summarized in the first two columns uses the duration of Al Qaeda propaganda output as the dependent variable aggregated to the weekly level. The third and fourth columns summarize a model using as the dependent variable a dichotomous measure that takes a value of 1 if Al Qaeda issued a communication in a given week and a value of zero otherwise. The duration variable is a count and shows evidence of overdispersion, so we use negative binomial regression in this model.[32] The output variable is a dichotomous variable, so the method in this model is logistic regression. Both models use robust standard errors. Since these variables are time series, we tested for 'stationarity,' and the absence of serial autocorrelation. Dickey-Fuller tests allow us to reject the null hypotheses that the time series have unit roots and to conclude that the data are stationary. Durbin-Watson *d* tests lead us to conclude that the data is unlikely to be characterized by serial correlation. In the robustness checks below we assess this possibility again, and find that correcting for serial correlation does not change the fundamental results.

Both models in Table 2 use as independent variables the controls discussed above and drone strikes in the current and previous twenty-four weeks. As discussed above, if drone strikes influence Al Qaeda's propaganda output, they are likely to do so with a lag. We do not have strong expectations about how far into the past any

Table 2. Drone strikes, duration, and propaganda output

	Duration		Output	
	Coefficient	S.E.	Coefficient	S.E.
Drone	−.04	.07	.17	.15
Drone$_{t-1}$	−.05	.06	−.03	.14
Drone$_{t-2}$	−.12	.08	−.38*	.14
Drone$_{t-3}$	.18*	.07	.66*	.21
Drone$_{t-4}$	.01	.06	.04	.16
Drone$_{t-5}$	.06	.09	−.11	.15
Drone$_{t-6}$	−.10	.07	.07	.15
Drone$_{t-7}$	−.07	.07	.02	.21
Drone$_{t-8}$	−.07	.09	−.12	.15
Drone$_{t-9}$	−.12	.07	−.05	.19
Drone$_{t-10}$	−.15*	.07	−.0	.16
Drone$_{t-11}$	.16*	.06	.35	.21
Drone$_{t-12}$	−.06	.07	.05	.15
Drone$_{t-13}$	.04	.08	−.13	.12
Drone$_{t-14}$	−.05	.07	.05	.14
Drone$_{t-15}$	−.18	.10	−.39**	.15
Drone$_{t-16}$	−.18*	.07	−.34*	.14
Drone$_{t-17}$	.09	.07	−.08	.15
Drone$_{t-18}$	.08	.07	.02	.13
Drone$_{t-19}$	−.01	.08	−.16	.17
Drone$_{t-20}$	.11	.08	.11	.17
Drone$_{t-21}$	.14*	.07	.26	.20
Drone$_{t-22}$	.03	.11	−.03	.17
Drone$_{t-23}$	−.04	.08	−.02	.16
Drone$_{t-24}$	−.02	.09	−.25	.18
United States troops	.00	.00	−.00	.00
Pakistan election	−.14	.38	−.21	.84
Afghanistan election	.80*	.33	1.17*	1.05
Rah-e-Rast Offensive	−.73	.64	−1.27	.94
Rah-e-Nijat Offensive	.69	.42	.69	1.77
Malakand Accord	.74**	.23		
Sher Dil Offensive	−.11	.49	−.56	.84
Orakzai Offensive	.30	.42	−.22	.80
Zalzala Offensive	−.04*	.31	.63	.58
Bin Laden death	−1.18**	.51	−2.56**	.94
Wald χ^2	96**		41*	
Observations	289		278	

Constant not displayed. $N = 289$.
*$p < .05$, **$p < .01$. Output model drops observations where Malakand is equal to one.

such lagged effect operates. Twenty-four weeks, or almost six months, seems sufficiently long enough that it should capture any effect of drone strikes on propaganda output. But the selection of this specific lag structure is arbitrary. To assess the

robustness of the findings reported in Table 2, we ran the same models with fewer and more lagged measures of drone strikes as well. The key inference of interest is the chi-squared test of the joint significance of all values of drone strikes included in the model. We summarize these in Table 3.

In Table 2, the chi-square test concludes that drone strikes in the current and previous twenty-four weeks have a statistically significant relationship to the duration and output of Al Qaeda propaganda. Table 3 shows that these chi-square

Table 3. Joint significance of drone strikes with varying lags

Number of drone strike lags	χ^2 that drone lags jointly equal to zero	Percentage of negative coefficients
	Duration	
2	3.38	
4	8.51	
6	15.03*	57
8	16.07*	78
10	22.16*	81
12	34.65**	77
14	35.97**	73
16	39.04**	71
18	47.46**	63
20	51.34**	57
22	56.73**	61
24	57.36**	56
26	61.63**	52
28	60.31**	52
30	66.89**	58
	Output	
2	2.65	
4	14.16*	20
6	14.85*	29
8	14.93	
10	14.86	
12	16.58	
14	18.21	
16	37.80**	53
18	36.24**	47
20	37.14*	48
22	37.02*	48
24	40.82*	56
26	41.27*	56
28	45.40*	52
30	49.26*	52

*$p < .05$, **$p < .01$.

statistics do not become consistently statistically significant in both models until between ten and sixteen weeks of lagged drone strikes are included. This suggests that any effect that drone strikes have on propaganda operates with a lag of about roughly two to three months. Drone strikes do not have either a positive or a negative influence on propaganda immediately following a strike.

What is the direction of the effect of drone strikes on propaganda? To answer this question, we examined the signs of the current and lagged values of the drone strike variables in models where the chi-square statistic indicated a statistically significant relationship to duration and output. This is summarized in the third column of Table 3. For the models using propaganda duration as the dependent variable, a small majority of the coefficient signs are negative. For the models using between ten and thirty weeks of lagged drone strikes as independent variables, between 55% and 71% of the coefficients were negative. The percentages of negative coefficients were somewhat smaller in the models using propaganda output as the dependent variable. Here between 37% and 45% of the coefficients were negative in models with statistically significant chi-squared statistics and lags of sixteen weeks or more. These models suggest that lagged drone strikes are associated with less Al Qaeda propaganda output. However, the fact that in the duration models only a small majority of the coefficients on drone strikes are negative, and that this finding changes when propaganda is measured as output, suggests a great deal of caution in unambiguously attributing decreased propaganda to drone strikes.

One might imagine that the relationships described in Tables 2 and 3 are the result of model specifications. To assess this possibility, we conducted additional robustness checks, which we summarize in the following paragraphs. In the models reported above, we controlled for forms of violence other than drone strikes that might influence Al Qaeda's propaganda output. Operationalizing and accurately measuring such violence is difficult, as some acts go unreported or may be exaggerated by combatants. In the models above we included dichotomous variables for Pakistani military offensives and peace accords aimed at militants in the north-west of the country. Since there is so little reliable information on the combat operations that occur during these offensives, we see little way to improve on these simple measures. We also included a measure of the number of United States military personnel in Afghanistan as a proxy for the pressure Al Qaeda faces from that side of the border. An alternative to this measure is a weekly count of the number of International Security Assistance Force (ISAF) personnel in Afghanistan who are killed in hostile action. The source for this data is the icasualties.org website. Compared to the troops measures included in the prior analysis, this measure might more accurately reflect the degree to which international forces stationed in Afghanistan are actively engaging with and pressuring terrorist and insurgent groups. Results from models using propaganda duration and output and replacing the number of troops with this variable are substantively similar to those reported above. The chi-squared statistic for current and lagged drone strikes becomes statistically significant when at least twenty weeks of lagged strikes are included in the models, and in most models just over half of the coefficients were negative in sign. The pattern of results for the output variable is also similar to that summarized in Tables 2 and 3, with fewer than half of the drone strike coefficients with a negative sign in models where they are jointly significant. Surprisingly, the casualties variable is not statistically significant in any of these models, suggesting that decisions to produce propaganda are not influenced by the intensity of combat operations.

Recall that the Durbin-Watson d test suggested that the time series data was not characterized by serial correlation. Nonetheless, we wanted to see if the substantive results change when using two techniques that correct for such autocorrelations. First, we re-estimated the propaganda duration model in Table 2 using ordinary least squares with Newey-West standard errors. Since these standard errors can only be calculated with ordinary least squares regression, we logarithmically transformed the dependent variable. In this model, current and lagged values for drone strikes become jointly statistically significant at four weeks, rather than twenty weeks as in the model reported in Table 2. For the models with less than eighteen weeks of lagged drone strikes as independent variables, just over half of the drone variable coefficients were negative. But roughly two-thirds of the coefficients were negative when more than twenty weeks of lagged drone strikes were included in the model. Here one's conclusions about the direction of the impact of drone strikes on propaganda differs depending on the number of lags included in the model; fewer lags is associated with a small negative effect, and more lags with a small positive effect. However, this is the only set of models where we find this relationship between drone strikes and propaganda, suggesting that it may be due to chance or model choice.

A second consideration concerns possible feedback from propaganda output to drone strikes. It is possible that the United States decides to launch drone strikes in response to Al Qaeda propaganda output. This could be the case for many reasons. First, the propaganda may permit the United States to more accurately target its strikes. Images and references included in a propaganda video may contain intelligence that permits the United States to discover the location where it was filmed or to identify participants. This intelligence could be used in the decision to launch drone strikes. Second, simply issuing propaganda could be viewed as a victory by Al Qaeda. Propaganda releases, especially those that include key leaders of the group such as bin Laden, receive attention in the international press. It is possible that the United States responds to propaganda by launching drone strikes. Such strikes could demonstrate to the American public, and to potential supporters of Al Qaeda in the region, that the United States continues to have the capacity to punish the group. If either or both of these propositions are correct, it would suggest an endogenous relationship between propaganda output and the timing of drone strikes. We evaluated this possibility by re-estimating the model using propaganda duration as the dependent variable, and adding as an additional independent variable propaganda duration lagged by one week. The results were qualitatively similar to those reported earlier. Drone strikes do not become jointly statistically significant until six or more weeks of lagged values are included in the model, suggesting little effect on propaganda output in the short run. For models that include more than six weeks of lagged drone strikes as independent variables, two-thirds or more of the coefficients are negative for lags from eight to sixteen weeks, after which roughly half are negative and half are positive. There is not a consistent pattern of drone strikes influencing the duration of propaganda output over the longer run.

Recall from the earlier discussion that the pace of drone strikes accelerated dramatically in 2008. It is possible that the effects of drone strikes on propaganda output strengthened because of this shift. Drone strikes may have been too infrequent in earlier years to have had a measurable output on Al Qaeda's organizational structure and its ability and willingness to produce propaganda. To assess this proposition, we re-ran the models reported in Table 2 for the period from January 1, 2008 to December 2011. Results were largely unchanged from those reported in Table 2.

Although this shift reduces the sample size by a large amount, it does suggest that later drone strikes do not have an appreciably different effect than does the entire sample of drone strikes included in the dataset.

Turning to the control variables, we see that relatively few have consistently significant relationships with propaganda output and duration. The number of United States troops in Afghanistan is not statistically significant, nor is the number of combat deaths among ISAF personnel in Afghanistan. Elections in Afghanistan increase propaganda in some models, but this relationship is not consistent. Pakistani military offensives are, for the most part, not statistically significant. The death of bin Laden has a negative and statistically significant relationship to both propaganda duration and propaganda output in almost every model. His death—in an armed raid, not a drone strike—may have disrupted Al Qaeda's propaganda efforts. However, the dataset we use has only five months of data following his death. It is possible that Al Qaeda's propaganda arm will rebound from this setback in the future.

Looking across all of these models, a number of patterns emerge. First, while any individual drone strike is unlikely to influence propaganda production, between roughly fifteen and thirty weeks of lagged drone strikes are jointly significant in models using either propaganda output or duration as the dependent variable. Second, drone strikes are not consistently associated with less propaganda. In most of the models using propaganda duration as the dependent variable, between half and two-thirds of drone strike coefficients are positive. But in the models using propaganda output as the dependent variable, roughly the same proportion of coefficients are negative. Furthermore, few of the coefficients on lagged drone strikes are statistically significant in any of the models. No strong or consistent patterns emerge where drone strikes have a positive or a negative influence on propaganda duration or output. We are thus reluctant to conclude from this with a great deal of confidence that drone strikes are associated with more or less propaganda. To reach this conclusion, we would prefer to see, at a minimum, a consistent finding across the models with different operationalizations of the dependent variable and a higher percentage of drone strikes with coefficients with consistently positive or negative signs. It is important to note too that in none of the models are a large majority of the drone strike variables negative in sign. We are thus more confident in concluding that drone strikes do not reduce or increase propaganda output and duration. These conclusions appear to be robust. Models using propaganda duration and output as dependent variables and employing different statistical techniques (negative binomial and logistic regression, respectively) produce broadly similar conclusions. The conclusions all are consistent across model specifications that varied the time period being considered, corrections for serial correlation, and other measures of conflict.

Conclusion

Do drone strikes hinder Al Qaeda's ability to engage in sophisticated political and military operations? We address this question by investigating the relationships between drone strikes and Al Qaeda propaganda output. Propaganda output is an important measure of organizational resilience and activity. Creating sophisticated propaganda requires a cadre of experienced producers, media workers, and "stars" who are all vulnerable to drone strikes. Thus if drone strikes hinder Al Qaeda's ability to operate effectively, this should be reflected in changes in the organization's propaganda.

We find little evidence that this is the case. Plots of the time series for drone strikes and Al Qaeda media output show no clear relationships. Regression analysis finds that drone strikes may be associated with more, not less, propaganda output. The relationship is not sufficiently clear-cut that we are willing to conclude that there has been a positive relationship between drone strikes and propaganda. However, in none of the regression models was the relationship clearly or strongly negative. This suggests that, at best, drone strikes have little or no effect on Al Qaeda's ability to create and issue propaganda. Al Qaeda's propaganda output appears to be quite resilient in the face of drone strikes.

In closing, we note that there are at least four limitations to the analysis. First, it is possible that we have failed to include important independent variables, or that the variables we do include suffer from measurement error. Obtaining accurate data on ongoing conflicts is often very difficult. Second, recall that we analyzed the effects of up to thirty-one weeks of drone strikes on propaganda output. It is possible that drone strikes reduce output but with a longer lag. It is also possible that the effects of drone strikes are cumulative over a longer period of time, and would eventually result in a sudden drop in propaganda output. We note, though, that this study includes longer lags than do others who analyze the effects of targeted killings on terrorist or insurgent groups, and that American policymakers claim that drone strikes are already degrading Al Qaeda's capacity to engage in political action. Third, propaganda output is only one of many "goods" that terrorist organizations such as Al Qaeda produce. Al Qaeda is also responsible for acts of violence, of course, as well as fundraising, recruiting, training, and so on. It is possible that drone strikes have a small or a positive effect on propaganda output, but have a negative influence on these other activities. This may be the case, but it is of course difficult for researchers to obtain accurate and reliable data about these activities. Propaganda output has the advantage of being clearly observable and measurable. Fourth, we have focused on the quantity of propaganda produced by Al Qaeda, but have little to say about the content of this propaganda. Analyzing how Al Qaeda's messages and themes have changed in response to the onset of drone strikes is an important challenge for future work.

The results suggest that drone strikes appear to have little effect on Al Qaeda's ability to generate and disseminate propaganda. This could mean that while drone strikes have killed many militants associated with the group, they have not been very effective in undermining its ability to plan and undertake complex actions. As noted above, drone strikes also involve some costs for the United States. Perhaps the most important cost is political. Foes of the United States decry the fact that some drone strikes kill or injure non-combatants. This could reduce political support for the United States' entire range of counterterrorist operations in Pakistan in particular. The findings suggest that the gains of drone strikes in terms of undermining Al Qaeda may be smaller that many believe.

Notes

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