



JULY 2018

Chemical weapons in Syria: do retaliatory bombardments deter their usage?

In-depth data analysis on alleged chemical weapon incidents in Syria shows that there is a surprising link between retaliatory bombardments and the use of chemical weapons. While diplomatic initiatives via the United Nations were often paralyzed by vetoes, retaliatory bombardments have proven to be one of the tools to (temporarily) stop the use of chemical weapons. The research suggests a solid command and control structure over the use of chemical weapons in Syria and implies that a credible threat to retaliate against the usage of chemical weapons in Syria can be effective in upholding the global norm against these weapons. Strengthening independent investigations in order to identify the perpetrators is required for international support to such retaliatory bombardments.

The Syrian conflict has caused enormous human suffering. Conventional weaponry has killed a large number of people, but chemical weapons attacks receive the most media attention and cause significant public reprisals. Yet, these attacks are not the deadliest, nor the most common. But the use of chemical weapons violates a global moral taboo, and is prohibited by the Chemical Weapons Convention (CWC) of which almost all states are members.¹ There is a serious risk that the global norm against chemical weapons may erode if using them is without consequence.

The use of chemical weapons can be difficult to detect in Syria. Apart from the chaotic situation on the ever-changing battlefield where no independent observers

are active, a propaganda war is taking place. Combating parties accuse each other of using chemical weapons to discredit the reputation of their adversaries or to persuade foreign intervention in their favour. In the fog of war, it is hard to define which accusations are real and which are false.

In this publication, chemical weapons incidents reported by different organisations are compared. By comparing the frequency of these incidents, the time period and their source, some overlaps emerge which provide an insight into the actual number of incidents. The trends help us to answer a key question surrounding international action in Syria: do diplomatic condemnation and retaliation by bombardments have an identifiable impact in ceasing the use of chemical weapons? Our answer is that retaliatory bombardments rather than diplomatic condemnation have yielded the effect of deterring the usage of chemical weapons temporarily.

¹ The only states that have not (yet) signed or ratified the CWC are: Egypt, Israel, North Korea and South Sudan.

Chemical weapons: defining what is what

Chemical weapons are defined by the Organisation for the Prohibition of Chemical Weapons (OPCW), the verification organisation of the Chemical Weapons Convention (CWC), as: “anything specifically designed or intended for use in direct connection with the release of a chemical agent to cause death or harm”. Some chemicals are solely used as weapons and are completely forbidden under the CWC (so-called Schedule 1 chemicals). Other chemicals are ‘dual-use’: they can be used for both peaceful and military purposes. These materials (Schedule 2 chemicals) are not prohibited and are generally freely available; only weaponizing them is prohibited.

The most commonly reported chemicals used in the Syrian conflict are sarin (a nerve gas – schedule 1) and chlorine (leading to suffocation – schedule 2) while a smaller amount is reported as ‘undetected’ (suggested to be [isopropanol](#)).

The OPCW has [declared](#) that all of the Syrian regime’s declared Schedule 1 and 2 chemicals have been destroyed. The destruction of chemical agents in Syria in recent years is the main explanation for the upward trend in global [chemical weapons destruction](#). However, there are continuing doubts as to whether [Syria actually declared all of its chemical weapon stockpiles](#) when acceding to the CWC in 2013.

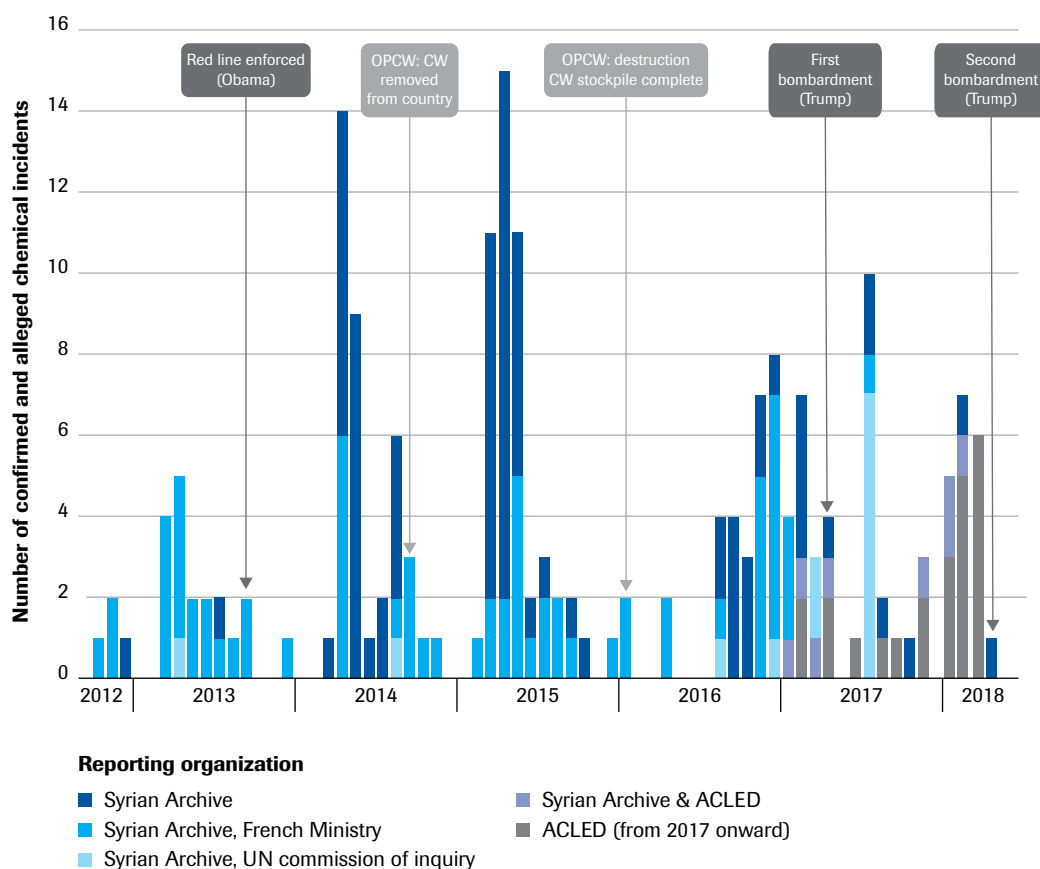
Moreover, the possession of chlorine is not forbidden because it has many civil applications, for example, to sanitize drinking water or to manufacture detergents. Using it as a weapon is prohibited, but the threshold between acquiring chlorine for peaceful purposes and secretly misusing a small amount for weaponizing is not very high. While creating advanced chemical weapons such as nerve agents is complicated, and requires advanced industrial facilities and laboratories, weaponizing Schedule 2 chemicals as improvised chemical weapons is relatively easy.

The number of (alleged) chemical incidents

The exact number of incidents involving chemical weapons in Syria is hard to verify. Sources of reported incidents do not always overlap. The [Independent International Commission of Inquiry on Syria](#) has verified 34 incidents since 2013, while noting there are more. In the UN Security Council, [the US](#) recently claimed that there have been 50 incidents. [Human Rights Watch](#) reported in 2017 that 85 chemical incidents have taken place in Syria. The [French Foreign Ministry](#), whose intelligence position in Syria apparently gives it relatively good access to evidence, has put the number of attacks at 130. [The Syrian Archive](#) has documented 212 chemical attacks since 2012, of which 26 occurred in 2017 and five in 2018. [ACLED](#) – an organization collating political violence incidents across the globe – has been collecting data on Syria from 2017 onwards. ACLED data provide similar high numbers as those reported by the Syrian Archive in 2017. Moreover, for 2018, its data report an even higher number of ‘alleged chemical incidents’ (19 incidents rather than the five reported by the Syria Archive).

This Policy Brief uses data from these organizations to make a number of observations on potential trends and key points in the use of chemical weapons across Syria. In particular we use data for the period 2012-2017 from the Syrian Archive, the Independent Commission of Inquiry on Syria and the French Foreign Ministry. These data stem from a range of (intelligence) sources and – for the Syrian Archive in particular – a range of vetted videos at the scene of the incidents. All these data have been verified and corroborated. With the exception of some events reported by the Syrian Archive, these data report fewer events for 2017 and hardly any events for 2018 and there is less information on the actors involved in the incidents (both perpetrator and recipient). We therefore supplement our analysis with data from ACLED for 2017-2018. ACLED data are not vetted and corroborated with physical or digital evidence. For this reason, we use the term ‘alleged chemical incidents’ for ACLED data and ‘verified

Figure 1 Distribution of (alleged) chemical incidents in Syria



chemical incidents’ for data from the other organizations. ACLED data comes from a [network of local Syrian partners](#) and international research institutions. Most of the partners are disclosed (e.g. Airwars and the Syrian Network for Human Rights), others remain anonymous for security reasons. The baseline of ACLED data stems from public sources (click [here](#) for more information on sources).

Figure 1 describes a large number of reported and verified (Syrian Archive and others – in blue) as well as alleged chemical incidents (ACLED – in black).² These data highlight that the number of chemical incidents in Syria is very large at over 200 incidents, far surpassing popular

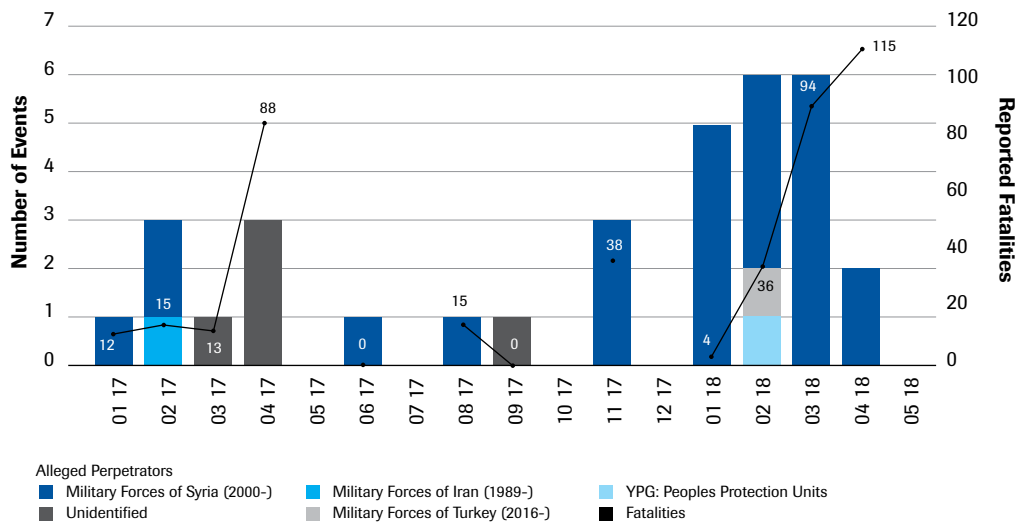
notions of brutal yet incidental attacks with chemical agents in Syria. Yet, the most poignant observation is the variation over time in the use of chemical weapons. Chemical incidents seem to be grouped in time. There are distinct clusters of chemical incidents reported at different points of the conflict. There are clusters in the middle of 2013, 2014 and 2015 and towards the end of 2016 and the beginning of 2018. There are similarly seven points in the conflict where chemical agents have (temporarily) not been used. We discuss the potential reasons for the clustering and the non-reporting of incidents later in this Policy Brief.

Figure 2 shows *alleged* incidents specifically reported by ACLED in 2017 and 2018, the years that were subject to retaliatory bombardments by the United States. Unlike the data from the Syrian Archive, ACLED data allow us to observe suspected perpetrators and fatalities (figure 2.a) and

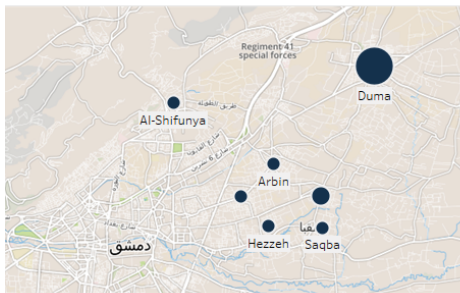
² Each reported event by every organization has been matched. See [here](#) for the method.

Figure 2

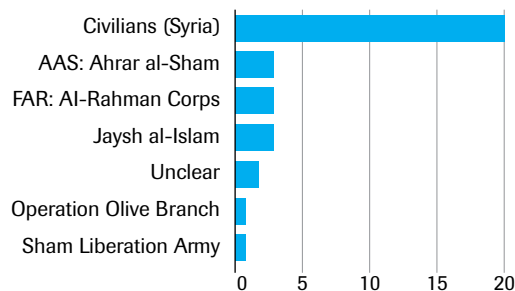
a. Perpetrators and suspected fatalities (2017-Present)



b. Alleged Locations



c. Alleged Victims



victims (figure 2.c). Most incidents are reported for the Rural Damascus Region (see figure 2.b).

For 2017 and 2018, ACLED data reports eleven and eight incidents, respectively, of suffocation, pupil dilatation, breathing difficulties and chlorine use; zero reports of Sarin use; while 14 cases of other chemical agents are reported.³ A similar clustering of events occurred in 2017 and 2018: particularly in the first months of 2018, both alleged chemical incidents as well as the number of estimated fatalities increased.⁴

ACLED data note that nearly all incidents in 2017 and 2018 are alleged to have been carried out by the regime (see figure 2.a on alleged perpetrators). These acts were predominantly directly aimed at civilians. A clear deviation to this pattern occurred earlier in 2018 when two potential incidents were reported near the Turkish border where both [Turkish](#) and [YPG](#) fighters were accused of firing a shell containing a chemical agent.

Which numbers are correct?

There is the possibility that chemical events are both *under-* and *over-*reported. Underreporting may occur through the same issues that plague the general [reporting of \(political\) violence](#). Reports come to light when they: a) are witnessed; b) are reported by the witness to a reporting outlet; and

3 An extract from the data is available on request; please contact the authors for this.
 4 Note that ACLED is likely to miss out on information for 2017 as, to date, some sources still remain to be published.

c) are subsequently published by that outlet. Research suggests that *underreporting* is common when the population is small, as there are fewer witnesses; when events take place in areas with an underdeveloped road network, in rural areas, and where there is an absence of phone coverage or when taboos are involved. There are several reasons why a story may not reach an outlet, especially when the events are small and have little impact. This is often true when there is an absence of fatalities in an incident, while there are many reports of high-level destruction. Outlets may not publish what is not newsworthy.⁵ Despite these issues in many conflicts, it is unlikely that underreporting affects the information on Syrian chemical events. In Syria, chemical incidents are often aimed at large, urban and dense populations. Moreover, given the intense scrutiny and outrage over chemical weapons use, such a story is of interest to nearly every outlet. Hence, it is not very likely that chemical incidents are underreported.

A greater problem is *overreporting*. Since the start of the war in Syria, belligerents have accused opponents of chemical weapons

use in an effort to discredit them and attract outside support. In 2013, opposition groups accused the regime in an effort to press for US military intervention. In turn, the Syrian regime counter-accused the opposition in an effort to present them as a [radical coalition](#). There is still fierce debate over who is culpable for the 2013 attack on [Eastern and Western Ghouta](#), the 2017 [Khan Sheikoun](#) attack and the recent hit on [Eastern Ghouta](#). Even independent verification processes have become subject to debate as Western states believe that Russia and other Assad proponents purposely [generate confusion](#); in turn, Russia believes that allegations of chemical incidents are used as a pretext for unauthorized Western actions. Independent and thorough verification is the only way to be sure about the true numbers.

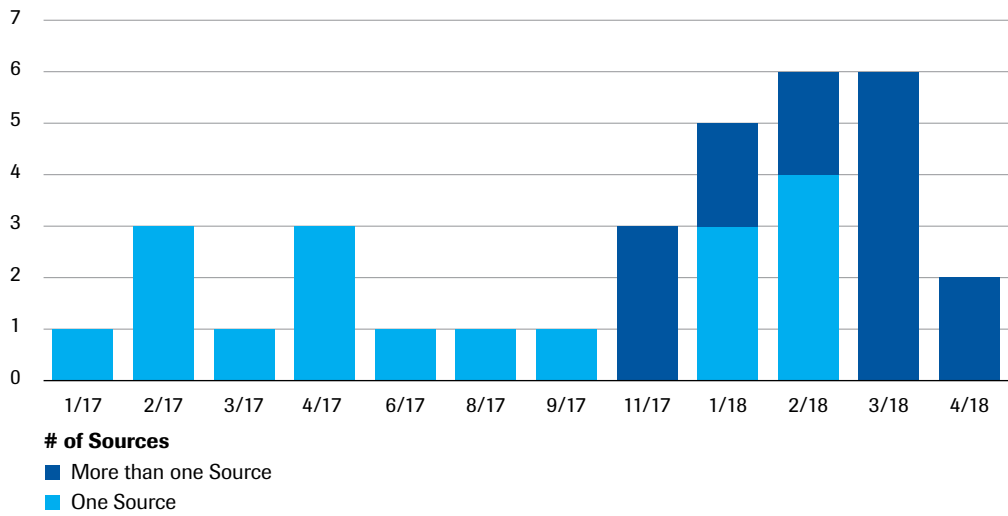
What about the incidents used in this report, are they subject to overreporting? Particularly for the events not corroborated/validated, overreporting may be a problem. However, we think that overreporting in Syria in ACLED data is – if it exists – minor, for two reasons. First, verification by the Syrian Archive suggests that of all the alleged incidents, less than 5% is not corroborated and may be a product of overreporting. Hence, the problem of overreporting appears to be limited. Second, one way of assessing the credibility of incidents is to count the number of independent sources reporting on an event. Research suggests that events reported by more than one independent source have a higher likelihood of being correct (see [here](#) and [here](#)). An analysis of ACLED data for 2017 and 2018 shows that most potential incidents in 2018 are reported by more than once source (see figure 3). This also suggests that the problem of overreporting is likely to be limited.

Military retaliation versus diplomatic action?

Chemical incidents have perhaps been the only consistent factor shaping the United States' position on the civil war in Syria, during both the Obama and the Trump presidency. A chemical attack on Eastern Ghouta in August 2013 prompted actions

5 Dustin Carpenter, Tova Fuller, and Les Roberts, "WikiLeaks and Iraq Body Count: The Sum of Parts May Not Add Up to the Whole—A Comparison of Two Tallies of Iraqi Civilian Deaths," *Prehospital and Disaster Medicine* 28, No. 03 (June 2013): 223–29; Nils B. Weidmann, "The Higher the Better? The Limits of Analytical Resolution in Conflict Event Datasets," *Cooperation and Conflict* 48, no. 4 (2013) 567–576; Weidmann, "A Closer Look at Reporting Bias in Conflict Event Data"; Megan Price and Patrick Ball, "Selection Bias and the Statistical Patterns of Mortality in Conflict," *Statistical Journal of the IAOS* 31, no. 2 (January 1, 2015): 263–72; M. Herbert Danzger, "Validating Conflict Data," *American Sociological Review* 40, no. 5 (1975): 570–84; Jennifer Earl et al., "The Use of Newspaper Data in the Study of Collective Action," *Annual Review of Sociology* 30 (2004): 65–80; Christian Davenport and Patrick Ball, "Views to a Kill: Exploring the Implications of Source Selection in the Case of Guatemalan State Terror, 1977–1995," *Journal of Conflict Resolution* 46, no. 3 (2002): 427–450; Robert Justin Goldstein, "The Limitations of Using Quantitative Data in Studying Human Rights Abuses," *Human Rights Quarterly* 8, no. 4 (1986): 607–27.

Figure 3 Corroborated Events



towards an attack led by the Obama administration. This counter-attack was avoided by the Assad regime acceding to the CWC and giving up its chemical stockpiles. In April 2017, the regime allegedly attacked Khan Sheikoun with chemical weapons, prompting the Trump administration to retaliate by bombing Shayrat Air Base. In April 2018, chemical attacks in Duma led to another bombardment by the US and its allies.

How effective has military retaliation been? To answer this, we compared how the reported number of incidents responded to diplomatic initiatives and the retaliatory bombardments.

In total the combined data show seven drops in reported chemical incidents in Syria (December 2012, September 2013, the autumn of 2014, November 2015/January 2016, April 2017, November 2017, and April 2017). What can explain these drops? Diplomacy, retaliatory bombardments or perhaps something else?

First, there are two relatively clear connections to be made between the drop in reported incidents and declarations by the OPCW. In the autumn of 2014 the OPCW stated that all declared Syrian chemical weapons and facilities were shipped out of the country or destroyed; after that, 5 months

passed with only one chemical incident being reported. In January 2016, the OPCW stated that all declared Syrian chemical weapons that were shipped out of the country were now destroyed. This time, nearly eight months passed with only two chemical incidents. The systemic increase from August 2016 followed upon an OPCW [announcement](#) in July 2016 that it suspected that the regime had been hiding chemical agents and still possessed them. Apart from many interesting observations that may stem from this, the apparent relation between the OPCW declarations and the regime’s behaviour is a first indication that the chemical weapon stockpile is (firmly) controlled by the Assad regime and also that it uses its chemical arsenal strategically. If true, this shows a more or less voluntary halt on the usage of chemical weapons by the regime in response to OPCW activities.

Two other drops – the one in December 2012 and the drop in November 2017 – are harder to explain. The drop in November 2017 is probably a result of a massive movement of regime forces from Raqqa, Deir-ez-Zor and Idlib to Rural Damascus after ISIS was ‘defeated’.⁶ The drop in December 2012 is more difficult to explain, though the fact that

⁶ More information [here](#).

the war had just started may explain the on-off character of chemical agent usage at that point in time.

This leaves three lulls in the usage of chemical agents, and all of these are directly connected to the only three instances where force has been used or was about to be used by the US against the Syrian regime. The first drop, in September 2013, coincides with the imminent threat to use force by the Obama administration after the regime had crossed the 'red line' of chemical weapons usage. The two other drops coincide with Trump's retaliatory bombardments in 2017 and 2018 (see figure 1) after which no reported chemical incidents occurred for more than 2 months. In 2017 there were no incidents reported for two and a half months after Khan Sheikoun; after that period, a potential chlorine attack was reported on June 22nd.⁷ For 2018, no incidents have been reported since the Duma attacks, as of early July 2018 (more than three months).

Comparing the absence of reported incidents for these three periods with the previous absence of incidents between clusters of reported incidents may point to more than a coincidence. The credible threats and usage of force seem to have led to a more cautious chemical weapon use policy by the regime. This suggests that retaliatory bombardments or credible threats thereof may be an effective tool to halt the use of chemical weapons.

However, correlation is no causation. The fact that there have been no reported incidents since the bombardment of April 2018 does not necessarily mean that the bombardment has caused the temporarily lull in usage. A definitive answer as to why the regime stopped employing chemical weapons at different points in time will perhaps only be available after the war when internal deliberations may become available through archives and oral history. In the absence of this, a viable strategy to make a reasonable case is to consider and rule out alternative explanations.

We consider two potential explanations, rule them out and subsequently discuss what diplomatic initiatives have yielded. The combined evidence suggests with considerable caution that the use of force seems to have been proven to be an effective tool to deter the usage of chemical weapons in Syria.

A first alternative is that the drop in chemical weapons usage after the retaliatory bombardments is a coincidence as the regime has accomplished its military goals (causing fear among civilians and combatants, resulting in them leaving a certain area). This argument – while plausible – is unlikely to explain why that usage has stopped. In 2013 the regime was not in a position to claim success and the usage of chemical weapons did not yield military success. Equally, the April 2017 attack on Eastern Ghouta did induce fear but did not help to dislodge Al Rahman Corps, Jaysh al Islam (Jal) and other rebel groups. It was only after the final incidents in April 2018 that rebel-groups were at a breaking point (and may have led Jal to sign an [agreement](#)). However, the chemical attack was one of many in the previous months thus begging the question why Jal did not withdraw before this time. It is more likely that it was an effect of a combination of pressuring activities (e.g., a massive airstrikes campaign since December 2017 as well as the successful ground operation in the weeks prior to the last incident splitting Eastern Ghouta into various enclaves).

A second alternative is that Iranian and Russian diplomatic pressure may have forced the regime into not using chemical agents after all three instances. However, the key point is that all bombardments were preceded *by multiple months of reported chemical incidents* and none of these led to a successful change in the regime's positions (assuming pressure was applied by outside allies). Hence, if Russian/Iranian pressure led to a change in the regime's position at all three points in time, it is likely that either pressure was applied or applied more forcefully because the US had used or threatened to use force.

Hence, while new evidence may be made available refuting our claims, the available

7 Which may be interpreted as a response to the US downing of a regime fighter aircraft in Raqqa.

evidence so far suggests that retaliatory bombardments are likely to be responsible for temporary lulls in the usage of chemical weapons by the Syrian regime. While we do not suggest that bombardments are the only viable policy option, it cannot be denied that the various diplomatic initiatives have not yielded similar results so far. The removal and destruction of declared Syrian chemical weapons stockpiles and production facilities, facilitated by the UN and the OPCW, was an important milestone, and these activities may have caused temporary pauses in chemical weapons usage as well. Yet, many chemical weapon incidents were investigated and attributed by the specially established Joint Investigation Mechanism (JIM) of the OPCW and the UN, but these reports were contested by Syria and its powerful ally, Russia. Attempts to follow up these reports with sanctions by the UN Security Council all failed because of [vetoes](#) by Russia and China. In October 2017 Russia even [vetoed](#) the extension of the mandate of the JIM. The effect of unilateral economic and diplomatic sanctions by various Western countries is unfortunately hard to measure, as is the effect of diplomatic pressure behind the scenes on Syrian allies like Russia and Iran.

Implications and suggestions

What does this mean? First and foremost that the Syrian regime has an apparent ability to halt the usage of chemical agents. Whether being told to do so by Russia or Iran or due to a deliberate choice, it has the power to temporarily stop the usage of chemical weapons. This observation fits [previous research](#) on the way the chemical weapons programme in Syria is tightly controlled by Assad's inner-circle (dubbed the 'Syria Kill Chain'). It also squares more generally with the way in which the Assad regime operates. For example, despite relying on outside proxies it still has a relatively significant hold over its [pro-government militias](#). The authority and capacity of the regime means that the possession of chemical weapons has become a deliberate strategic tool to further regime interests.

A core implication is that retaliatory bombardments are likely to have a real,

albeit temporary, effect on the military realities on the ground. Despite claims that the US response was not driven by a strategic calculation to enforce a norm but rather the emotional response of President Trump vis-à-vis the [images of suffocating children](#), the effects have been more 'positive' in upholding a norm than most – including these authors – may initially have imagined. The implication is that bombardments may be one of the strategic tools via which the norms against the usage of chemical weapons can be upheld.

This also means that decisive action against any new chemical incident – however small – is necessary. The large-scale chemical attack on Duma in 2018 was preceded by a number of smaller incidents in the months prior to the attack. Alleged chemical incidents occurred from January 2018 onwards; as the regime was closing in on Eastern Ghouta there was a clear build-up of incidents. This suggests that chemical incidents in Syria are 'social' in nature: they rarely come in isolation but are clustered in time and space.

A striking feature of the last spike in alleged incidents is also the increased lethality of incidents. While chemical weapons in Syria are thought to be a tool to break the resistance of rebel groups after they have been brought to a breaking point, the slow build-up may also suggest that the regime has been slowly increasing the magnitude of attacks in an attempt to test whether and where international red lines are drawn. It continues when it is not forced to stop. From a policy perspective this means that new incidents may need to be responded to swiftly and decisively as soon as new reports of chemical weapon attacks begin to emerge. Without retaliation, every new chemical attack may further erode the global norm against using chemical weapons.

A final implication is that the verifiable attribution of alleged chemical weapon incidents is required. If retaliatory bombardments are one of the effective tools to prevent the further use of chemical weapons in Syria, it should be clear which allegations are true, and who is responsible for the proven incidents.

Yet this is a problem as the activities by the OPCW and the UN to investigate chemical incidents in Syria have been seriously hindered. Even thorough reports through the specially established Joint Investigation Mechanism (JIM) were contested by Syria and its powerful ally, [Russia](#). In October 2017 Russia vetoed an extension of the mandate of the JIM, which meant there is no longer any diplomatic attribution mechanism for the use of chemical weapons in Syria. The OPCW still tried to investigate the alleged incidents but was not mandated to attribute them. In June 2018 a special Conference of States Parties to the CWC decided that the OPCW should attribute proved chemical incidents as well – how this will work out in practice is yet to be seen.

Strengthening the capabilities of the neutral OPCW to investigate and attribute is one way of creating broader international support for any retaliatory actions. Yet, even if the complicated problem of the attribution mandate will be definitely resolved, the timeframe for verification and attribution is currently fairly long as it generally takes at least several weeks to come to a report. A speedier process should be possible. In both cases of US retaliatory strikes, convincing evidence of the attack's perpetrators surfaced within a few days via intelligence services that are active in Syria. To work on alternatives, policy-makers aiming to uphold the global norm on the prohibition of chemical weapons may also consider strengthening the position of public verification initiatives such as the Syrian Archive. As long as some states are eager to even cast doubt on neutral multilateral expert organisations like the OPCW for its alleged “[very mediocre](#)” research quality, others should not be afraid of similar criticism of public verification initiatives.

Conclusion

In-depth data analysis on alleged chemical weapon incidents in Syria show that incidents slow down or temporarily come to a halt after retaliatory bombardments. For that reason, this Policy Brief argues that in order to stop the use of chemical weapons and to uphold the global norm against these weapons, retaliatory bombardments at

military locations should be considered as an effective instrument. The effects of these counter-attacks are enabled by the apparent top-down control over the use of chemical weapons in Syria, as the regime is clearly using weapons in a strategic and targeted way. More research is nevertheless required to strengthen the link between retaliatory bombardments and drops in the usage of chemical weapons.

Because chemical weapon incidents in Syria do not occur in isolation but are clustered in time and space, it follows that retaliation should occur as soon as possible after a reported chemical weapon incident. However, quick response requires an independent attribution of chemical weapon incidents. The only neutral, multilateral organisation with excellent expertise in chemical weapons investigations, the OPCW, could play an important role here, even though its speed of investigations and attribution should ideally increase and it is facing unfair criticism from some of its member states. Other avenues, such as strengthening the position of public verification initiatives, could be explored as well.




These findings lead to three policy recommendations:

1. Stringent upholding of the global norm of the prohibition of chemical weapons by military means can be effective, particularly when there is a [clear 'kill chain'](#) and top-down control over the use of chemical weapons;
2. Chemical weapon incidents in Syria have been highly 'social': where there was one incident there were often various incidents clustered together in time and space. This suggests that the earliest reports of any incident should be punished in order to prevent further usage;
3. The verification of alleged incidents by the neutral OPCW is crucial. The OPCW investigations should ideally be quicker, and it will be helpful that its mandate was recently expanded to include assigning [culpability](#). Strengthening the position of public verification initiatives could be explored as well.

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