BUILDING THE EVIDENCE BASE

Addressing the Reverberating Effects of Military Operations on Civilian Life

Workshop Report

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A United Voice For Global Change

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Introduction

In contemporary armed conflicts, damage to and destruction of civilian objects — such as personal property and assets, public services, and critical infrastructure — has had devastating reverberating effects[1] on civilian life and livelihoods despite protections under international humanitarian law (IHL).[2] Indirect effects include interrupted or restricted public services, such as medical care and water supply and sanitation, loss of skilled technicians, disease outbreaks and other public health emergencies, loss of livelihoods and other economic losses, food insecurity, displacement, trauma, and other mental health impacts.[3] In recent conflicts, the majority of civilian deaths result not from bombs and bullets, but from these and other indirect effects.[4]

Although these reverberating harms define the experience of conflict-affected civilians around the world, comprehensively documenting and understanding these effects to better prevent and respond to indirect harm poses methodological and coordination challenges for academic, humanitarian, and human rights practitioners alike. This report identifies some of these challenges and proposes a way forward to build the evidence base on the reverberating effects of military operations on civilian life and ultimately improve outcomes for conflict-affected civilians.

This report is informed by a light review of existing documentation and an interdisciplinary expert workshop hosted by Stanford Health Policy and InterAction to explore gaps and opportunities to document, analyze, and influence policy and practice to minimize and respond to the indirect effects of armed conflict on civilians.[5] The workshop also sought to convene a community of interest with an overarching purpose: building an evidence base around reverberating effects that can inform ways to prevent and respond to the *totality* of harm experienced by civilian populations caught up in armed conflict.

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[1] Also known as indirect, second- and third-order, cascading, or knock-on effects. See Michael Talhami and Mark Zeitoun, "The impact of explosive weapons on urban services: Direct and reverberating effects across space and time," *International Review of the Red Cross,* War in Cities in Edition, April 2016, Vol. 98, No. 1, pp. 53-70. See also Isabel Robinson and Ellen Nohle, "Proportionality and precautions in attack: The reverberating effects of using explosive weapons in populated areas," International Review of the Red Cross, April 2016, Vol. 98, No. 1, pp. 107-145.

[2] See for example International Rescue Committee and Norwegian Refugee Council, "In Search of Safety," July 2016. See also: International Committee of the Red Cross, "'I Saw My City Die': Voices from the Front Lines of Urban Conflict in Iraq, Syria, and Yemen," 14 June 2017.

[3] Civilian objects include public services, critical infrastructure, private property, cultural assets, and other objects of value to civilian populations. See for example Michael Talhami and Mark Zeitoun, "The impact of explosive weapons on urban services: Direct and reverberating effects across space and time," *International Review of the Red Cross,* War in Cities in Edition, April 2016, Vol. 98, No. 1, pp. 53-70. See also NGO Recommendations to DoD Policy on Civilian Harm, "Protection of Civilian Objects including Critical Infrastructure in U.S. Military Operations," November 2019.

[4] Paul H. Wise, "The Epidemiologic Challenge to the Conduct of Just War: Confronting Indirect Civilian Casualties of War," *Daedalus,* Winter 2017.

[5] The workshop, titled "Building the Evidence Base: Addressing the Reverberating Effects of Military Operations on Civilian Life," was held via video-conference in three sessions on May 17, 21, and 27, 2020 and included 45 participants from 34 organizations, including non-governmental organizations and UN agencies. Participants included academic researchers; humanitarian policy advocates, field operators, and thematic specialists; human rights advocates and researchers; think tank experts; and independent experts. Thematic expertise included health, environment, displacement, water, energy, land and property rights, human rights, civilian protection, humanitarian mine action, remote sensing, engineering, and data analysis, while geographic expertise covered the Middle East, North Africa, the Horn of Africa, Central Asia, Southeast Asia, Eastern Europe, and Latin America. The format of the sessions included short expert presentations on critical gaps and new research initiatives, followed by focused breakout discussions on overarching challenges and potential solutions around the areas of data collection, research methodology, policy and advocacy, ethics, and sector-specific issues. This report was compiled by Annie Shiel, Research Program Manager in Humanitarian Response and Civilian Protection at Stanford Health Policy and Archibald S. Henry, Policy Coordinator at InterAction, drawing on insights from expert participants of the workshop as well as other materials referenced herein. This project was supervised by Jenny McAvoy, Director of Protection at InterAction, and Dr. Paul H. Wise, Senior Fellow at the Freeman Spogli Institute for International Studies and Richard E. Behrman Professor of Child Health and Society.

Notably, while civil society can play a critical role in documenting, analyzing, and responding to these harms, it remains the primary responsibility of State and non-State parties to conflict to protect civilian objects from attack by distinguishing between civilian objects and those of a military character and ensuring proportion and measures of precaution when launching attacks—including by taking into account the foreseeable indirect effects of attacks. As such, efforts to build the evidence base on the reverberating effects of military operations should be oriented towards fulfilling the letter and spirit of these obligations by strengthening the policy and practice of armed forces to avoid and minimize such harm.

Key Insights

This report details the insights of the expert workshop and recommendations for the next steps to be taken by this broad community of interest. Key insights include:

- **The interconnectedness of systems and services that make urban environments thrive also makes them vulnerable to disruption during conflict and complicates the analysis of resulting reverberating effects.** Attempts to fully understand and prevent, minimize, or respond to these effects require a common understanding of these systems' interconnectedness and key concepts for analyzing them in a holistic way.
- **Experts in the humanitarian, human rights, and academic fields approach the challenge of building the evidence base on reverberating effects with varied purposes.** These purposes include influencing policy and practice of military actors to minimize damage to civilian objects and their reverberating effects; informing humanitarian preparedness and planning, real-time decision making about response during conflict, and mid- to long-term reconstruction efforts; preserving evidence to support formal accountability and justice efforts; and informing the public and policymakers about the human costs of war.
- **Effectively building the evidence base requires improved collaboration within and across relevant sectors.** This includes an improved process for handling data requests to the field, timely feedback loops to ensure that information and research insights arrive in the hands of decisionmakers, and cooperation in developing and circulating comparative case studies that identify lessons learned.
- **Advancing methodological development requires improving the coherence, consistency, and transparency among researchers and other key stakeholders regarding definitions, research methods, and coding decisions.** These steps can be undertaken through further interdisciplinary discussions as well as through individual and organizational commitments to transparency in data archiving and publishing.
- **The data-constrained environments that characterize armed conflict demand innovation to generate and discover data useful in understanding the reverberating effects of conflict.** These include both low- and high-tech methods such as improved use of open-source intelligence, remote sensing, and machine learning, as well as local surveys and witness interviews, cross-sectoral data sharing processes, and improved investigative methods to unearth pre-conflict data, for example, about public infrastructure and services.
- **Researchers must do more to seek out and elevate the voices of populations most affected by armed conflict.** This demands new and improved methodologies to fully capture civilians' experiences,

perspectives, needs, and expectations regarding the indirect effects of military operations, as well as greater commitments from humanitarian, human rights, and academic communities to amplify the perspectives of the civilian populations on how damage to civilian objects affects their lives and livelihoods and disrupts local communities.

- **More must be done to compel States to avoid and minimize damage to civilian objects and to consider the totality of harm caused by their operations.** To do this, State military forces should strengthen their own evidence base on damage to civilian objects, including by developing the methods and means to estimate and assess the reverberating effects of damage to civilian objects, pro-actively and systematically collecting, analyzing, and learning from data on the reverberating effects of their operations, and incorporating relevant measures to avoid and minimize such harm in contemporary and future operations.

Framing the Challenge

Identifying vulnerability in urban systems

The very interconnectedness that allows urban systems and services to thrive also makes them vulnerable to disruption during conflict. This interconnectedness also poses a challenge for those working to trace and analyze military operations' reverberating effects. As Talhami and Zeitoun (2016) described, essential services should include not only physical infrastructure but also the people, consumables, and hardware involved in dispensing these services.[6] For example, health services consist not only of hospitals and clinics but also of health workers, medicines, and ambulances, all of which depend on power, water, roads, and other infrastructure to function effectively; and which may be harmed directly and indirectly during conflict. Each urban system presents its own hierarchy of infrastructure, from upstream services such as electric grids and water treatment facilities where a single point of failure may disrupt service provision across a number of sectors, to mid- and downstream distribution networks and local infrastructure such as individual water pumps or electric towers.[7] As a result of this hierarchy, the reverberating effects of military operations may not be evident solely from the visible damage in a given area. For example, the physical destruction of water or agricultural infrastructure in one area may affect the water or food supply in an area not directly impacted by military operations, with additional reverberating effects for health, nutrition, and other measures of wellbeing. Analysis of reverberating harms must also consider non-kinetic operations such as sieges, blockades, and economic sanctions, all of which may impact the people, consumables, and hardware essential for service provision.

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Ultimately, the interconnected nature of urban systems means that fully isolating the effects of a single pathway of reverberating harm is likely to be challenging. Rather, damage to urban systems compounds over time, with accumulating effects on health, food security, livelihoods, education, the environment, and other indicators.

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[6] On the reverberating effects of military operations, Talhami and Zeitoun write: the damage caused by explosive weapons on any component of a service can have a "domino effect" on other services. Damage to an electrical substation can halt the municipal drinking water supply, and this "toppling" type of reverberating effects can lead to loss of sterilization capacity in the operating theatre, as just one example." See Michael Talhami and Mark Zeitoun, "The impact of explosive weapons on urban services: Direct and reverberating effects across space and time," *International Review of the Red Cross,* April 2016: 61.

[7] Talhami and Zeitoun, 2016.

"A single pipe broken by a high-impact explosive weapon can deprive 100,000 people of water. That same weapon may also destroy the neighbourhood's sewage system, causing thousands to fall ill and placing further strain on already overstretched hospitals."

International Committee of the Red Cross, "I Saw My City Die"

Confronting varied purposes and approaches

Different actors approach the issue of building the evidence base around the reverberating effects of conflict with varied roles, objectives, techniques, and time horizons. Recognizing these varied purposes and approaches is essential to facilitating interdisciplinary collaboration around this important issue.

A primary objective of operational humanitarian organizations is, in the first instance, to prevent and alleviate suffering resulting from conflict. Because of their presence in conflict-affected areas, humanitarian organizations are often well-poised to collect information on observed impacts of damage to civilian objects on the populations they work with. However, this information is likely to be focused on the organization's sectors of work with the immediate purpose of identifying needs, informing near- and medium-term humanitarian response activities, and anticipating longer-term consequences and reconstruction needs. Humanitarian organizations are also interested in ensuring that relevant information is mobilized in real time to restrain the conduct of hostilities in specific military operations. Humanitarian organizations may also have broader, longer-term goals to influence military policy beyond specific operational contexts. Even within one sector or organization, field staff and headquarters-based advocates' immediate objectives are likely to vary. Additionally, the operational capacities needed to sustain information-gathering and efforts to influence the conduct of parties to conflict may not exist in each organization or response operation.

Human rights organizations are also likely to document conflict-related damage of civilian objects and resulting effects on civilians, often with the purpose of examining IHL and human rights implications, highlighting violations of international law when they occur, promoting acknowledgment and accountability for harm caused, and influencing the conduct of armed actors to prevent future harm.

Finally, although less likely to have consistent access to data on the ground, academic and research-oriented organizations possess essential research design and analytic capabilities. They may also have regional and linguistic expertise to conduct field research over more extended time periods in areas before, during, and after conflict. Their objectives may range from producing short-term analytic products to influence policy and practice to longer-term peer-reviewed publications and studies aimed at learning lessons, building the evidence base, and influencing future policy and practice. Research methodologies that can be employed to study the impacts of reverberating effects include comparative analysis, case studies, historical analysis, surveys, interviews, geographic information system (GIS), and geospatial analysis as well as new and emerging analytical approaches, discussed further below.

Any attempt to collaborate on addressing the challenges outlined in this report must contend with and reconcile these varied yet compatible purposes. Critically, to maximize interdisciplinary collaboration and avoid miscommunication, any collaborative effort to develop evidence should be explicit about the specific purpose and intended uses of the information gathered and the analysis developed.

> *"Airstrikes resulted in the damage of a sanitation facility and water station that supplies Hodeidah with most of its water. After this incident, suspected cholera cases almost doubled between July (732) and August (1,342) in Save the Children-supported health centres."*
>
> Save the Children in Hodeidah, Yemen

Key Challenges to Building the Evidence Base

Challenges in data collection

Establishing baseline data on the presence of civilian objects and capturing human development indicators prior to military operations -- such as morbidity and mortality, standards of living, and access to essential services -- are necessary to facilitate comparison to conditions following military operations. Baseline data on the number of people served by certain infrastructure and services is also critical to predicting the reverberating harms arising from the object's damage or destruction. However, detailed and credible baseline data typically does not exist or may not be publicly accessible, particularly in fragile and/or weakly-governed states where armed conflict is most likely. Moreover, since essential services in developing countries are often inadequate and intermittent, many households and businesses source water and electricity through formal and informal means, using private vendors, informal boreholes, and other undocumented assets or services. Researchers and practitioners often thus do not have a good or holistic grasp of public service provision, cost structures, and infrastructure use.

Even when they are able to share information, field offices in high-profile conflicts or crises report an overwhelming demand for data from academic and policy-oriented organizations that they lack the capacity to meet. Humanitarian participants also noted that when they are able to share data, there is often little transparency or feedback around how their data is used and to what end.

Empirical analysis of reverberating effects also requires documentation of damage to and destruction of civilian objects and the observed effects that followed. Given the protracted nature of many of today's conflicts, as well as the fact that certain reverberating effects may become more difficult to attribute over time, this information often must be collected while conflict continues. Data collection during conflict faces a number of challenges, including the breakdown of information systems, security risks during data collection, lack of access to conflict-affected areas due to restrictions enforced by warring parties, and disincentives for civilians to participate in surveys or respond to questions truthfully. Finally, comprehensive data during protracted conflicts and during

post-conflict periods is required to assess longer-term reverberating effects of conflict over multiple generations, including long-term health, education, and livelihood outcomes.[8]

Finally, the data required to effectively build the evidence base on reverberating effects is often located in different organizational and disciplinary silos. Operational humanitarian organizations and agencies often hold rich information on health, livelihoods, displacement, and access to essential services for conflict-affected populations. Yet, they may be hesitant to share this information with other actors due to valid concerns around individual data privacy or their ability to maintain neutrality. Even when they are able to share information, field offices in high-profile conflicts or crises report an overwhelming demand for data from academic and policy-oriented organizations that they lack the capacity to meet. Humanitarian participants also noted that when they are able to share data, there is often little transparency or feedback around how their data is used and to what end.

While government line ministries and services may also have their own baseline data, many government offices in conflict-affected areas have not had the will or capacity to collect such data, and these efforts are typically suspended during conflict. International development actors may have baseline and long-term data on human development indicators impacted by conflict events, and independent research organizations in conflict-affected countries often attempt to continue to collect essential data. Typically, however, both official and independently-collected data is difficult to verify. This is particularly the case where governments collecting data are also parties to the conflict, as is the case in most civil and protracted conflicts.

Challenges to research and analysis

Even when data is available, there are a number of challenges to developing effective and interoperable research methodologies. First, various overlapping terms are used to refer to reverberating effects, including "indirect effects," "cascading effects," "knock-on effects," and "second- and third-order effects." These terms lack precise definitions, and it is unclear to what extent they are synonymous. There are also multiple approaches and typologies for coding and analyzing data, including types of armed actors involved, types of conflict, types of weapons used, the motive or intentionality of an attack, and the type of object impacted. As a result, datasets are often not interoperable, posing a challenge to empirical research.

Conflict is complex and chaotic, and observed indirect harm could be the result of any number of variables or, more likely, the confluence of a number of variables. Reverberating impacts are also likely to compound over time, creating additional challenges for analysis in protracted conflicts.

The process of drawing causality between conflict events and observed reverberating effects poses a number of methodological challenges. Excess mortality, which captures the difference between observed and expected death rates – in this case, the number of deaths during conflict and those which would have been expected absent conflict – offers one method for identifying both the direct and indirect deaths resulting from conflict. However, this measure depends on reliable baseline mortality data and does not identify the specific pathways of harm – i.e., what specific conflict events resulted in death and why. Establishing causality between a specific conflict event and resulting reverberating effects or attributing a reverberating effect to a specific conflict event is a much more difficult methodological feat. Conflict is complex and chaotic, and observed indirect harm could be the result of

[8] Further complicating post-conflict data collection is the fact that many international organizations that conduct post-conflict assessments must be invited by the host nation, which can delay timely collection of information.

any number of variables or, more likely, the confluence of a number of variables. Reverberating impacts are also likely to compound over time, creating additional challenges for analysis in protracted conflicts.

Understanding complex indirect harm pathways is further complicated by the siloed nature of not only data itself, but also of essential technical expertise. Humanitarian actors specializing in issues such as health, displacement, livelihoods, and housing have invaluable experience and insight into the reverberating harms felt daily by the communities they serve. Technical experts in energy systems, water, sanitation and hygiene, food systems, and economics understand the vulnerabilities of interrelated systems and the mechanisms by which failure may cause reverberating harms. Analytic experts such as epidemiologists, engineers, and social scientists have the capability to empirically model and analyze harm. However, the opportunities for sharing of expertise and lessons among these varied groups are few and far between, hindering comprehensive and useful analysis.

> *"What is most upsetting is that this looming famine is entirely man-made. We are seeing countless children under 5 on the verge of death because they were given no other option than to be caught in the middle of this war."*
>
> International Rescue Committee in Maiduguri, Nigeria

Other obstacles to accurately depicting the reverberating impacts of war on civilians include the fact that some conflict-affected populations are often internally and internationally displaced. Disparities in who flees and who stays may result in non-representative skewing of the populations available for data collection. Exposures to violence also vary at the local level, meaning that reliance on national or regional data may obscure the impact of war on specific communities.[9]

Ethical challenges

Building the evidence base on the reverberating effects of military operations presents several ethical challenges and considerations. First, the very process of assessing the vulnerabilities of urban systems for the purpose of influencing the conduct of armed actors could put these systems at risk. Providing armed actors with public or private information about the location of civilian objects, the number of civilians they serve, the interconnectedness of systems, and anticipated reverberating effects from their damage or destruction can indeed influence them to minimize direct and indirect harm to civilians. At the same time, armed actors could use this information to illegally target civilian objects, including critical infrastructure, dual-use objects, and objects believed to be "war-sustaining," as part of a deliberate strategy.[10] By highlighting the infrastructure that must be protected, well-intentioned advocates might inadvertently contribute to the targeting process. Such concerns have arisen, for example, in relation to Russian and Syrian targeting of objects on the UN no-strike list in Syria.[11] In addition to continually reinforcing the legal and moral imperatives of avoiding such damage, attempts to prevent

[9] Paul H. Wise, "The Epidemiologic Challenge to the Conduct of Just War: Confronting Indirect Civilian Casualties of War," *Daedalus*, 2017.
[10] For example, armed actors may target civilian objects such as food systems to pursue military, political, and/or economic objectives. See Alex De Waal, *Mass Starvation: The History and Future of Famine*, Polity, 2018.
[11] Evan Hill and Whitney Hurst, "The U.N. Tried to Save Hospitals in Syria. It Didn't Work," *The New York Times,* 29 December 2019; Evan Hill and Christiaan Triebert, "12 Hours. 4 Syrian Hospitals Bombed. One Culprit: Russia," *New York Times*, 13 October 2019; and Aron Lund, "The UN Made a List of Hospitals in Syria. Now They're Being Bombed," *The Century Foundation*, 13 June 2019.

reverberating effects by providing armed actors with relevant information must, therefore, weigh the benefits and risks of doing so.

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Second, demands for data collection and information sharing pose challenges for individual and organizational privacy and security. Humanitarian data regarding the provision of medical and other aid; documentation of attacks on healthcare, aid workers, and other protected persons; and documentation of specific human rights abuses entails the collection of personal and organizational information that may identify and endanger vulnerable people and broader humanitarian operations. Organizations may also collect broad categories of data, including personally identifiable information, without a clear purpose or use. Organizations collecting data have an inherent responsibility to protect the privacy and security of this kind of information and should only collect the information they need to meet a specific purpose to minimize the risk to vulnerable individuals.[12]

Third, the act of documenting and analyzing reverberating civilian harm raises important questions around justice and the responsibility of actors involved to promote remedy for affected communities. Especially in contexts where prospects for justice likely remain quite low, researchers and practitioners should be intentional in identifying the purpose of their efforts. These purposes may include memorialization, assessing reconstruction needs, or improving long-term prospects for accountability. Researchers should also recognize that data collection attempts may raise unrealistic expectations and engender frustration among affected civilians if efforts do not translate to tangible improvements in their communities.

Humanitarian actors involved in building the evidence base around reverberating effects must systematically consider the humanitarian principles of humanity, neutrality, impartiality, and independence.[13] The requirement to avoid real or perceived partiality or bias toward parties to conflicts may complicate their efforts to document reverberating harms or engage with armed actors on the basis of these concerns. Given core concerns around their safety and ability to operate, if perceptions of neutrality would be compromised, humanitarian organizations may be reluctant to engage at the field level beyond ad-hoc data collection and analysis for the purposes of immediate response needs.

"Before the strikes, Issak had 240 coconut trees whose biweekly harvest brought her about $250—roughly $6,000 a year. Livestock and crops are the main sources of livelihood in Somalia—as they are for Issak, who says less than a quarter of her trees survived."

Amanda Sperber reporting from Somalia for *In These Times*

[12] See "Humanitarian activities and the protection of personal data," in ICRC, *International Humanitarian Law: Handbook for Parliamentarians N° 25*, 2016, p. 82; ICRC, "Handbook on Data Protection in Humanitarian Action," Second Edition, August 2017; Harvard Humanitarian Initiative Signal Program on Human Security and Technology, "The Signal Code: A Human Rights Approach to Information During Crisis," January 2017. Add reference to Ch. 6 of ICRC Data Protection Handbook.

[13] UNOCHA, "What are Humanitarian Principles?"

Challenges in influencing States

Parties to conflict, including State military forces, have the primary responsibility for avoiding and minimizing damage to civilian objects. However, despite these responsibilities under international law, compelling States to consider various forms of indirect harm to civilian populations in policy and practice is challenging. National-level policies on military targeting and the protection of civilians are either non-existent, pay scant attention to the protection of civilian objects, or do not explicitly address the issue of indirect civilian harm. State militaries also often fail to invest in data collection around civilian harm and its impacts. As a result, militaries lack a systematic approach to avoiding and minimizing indirect harm, from military planning and intelligence preparation to post-strike analysis and lessons learned. Individuals involved in advocacy with States observe that they have never encountered a military that systematically considered potential reverberating effects in targeting.[14]

For example, while militaries' no-strike lists are designed to include protected objects under IHL, the methodology for developing these lists does not necessarily weigh the reverberating effects of potential damage or destruction to these objects in a comprehensive fashion.[15] When making proportionality assessments during targeting, militaries generally rely on an *object-based* rather than a *system-based* approach, meaning that they consider anticipated first-order impacts on objects rather than comprehensively assessing potential knock-on effects on broader systems –and, consequently, on human life – before conducting strikes. These assessments rarely consider the interdependence of civilian objects or their role in sustaining civilian life and livelihoods.[16]

Further, State militaries' post-strike assessments are limited to direct civilian casualties and do not examine the *totality* of civilian harm, which would include indirect and long-term consequences of their operations. Without examining the totality of harm, State militaries cannot adequately learn from their operations nor apply lessons to future efforts to minimize civilian harm.

The Explosive Weapons in Populated Areas (EWIPA) initiative is one important effort to call on States to systematize their own data collection on reverberating effects from explosive weapons use and harness this data to minimize harm throughout the course of their operations.[17] However, States have pushed back and voiced concern that such data could be used to pursue legal accountability.[18]

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[14] InterAction and Stanford Health Policy, "Building the Evidence Base: Addressing the Reverberating Effects of Military Operations on Civilian Life", Virtual Workshop, May 17, 21, and 27, 2020.

[15] For example, anticipating loss of clean water access in a community following damage to a water station, or food insecurity following the destruction of a vital bridge. See NGO Recommendations to DoD Policy on Civilian Harm, "Protection of Civilian Objects including Critical Infrastructure in U.S. Military Operations," November 2019, in particular see: "Annex: Damage to Civilian Objects and Types of Impact on Civilian Life" (p. 9). On challenges with no-strike lists (NSL), see for example Ben Parker, "What is humanitarian deconfliction?," The New Humanitarian, 13 November 2018. See also UNOCHA, "Compilation of military policy and practice: Reducing the humanitarian impact of the use of explosive weapons in populated areas," *OCHA Policy and Studies Series*, 2017.

[16] To help minimize risks in targeting by military actors, including "dynamic targeting," there is a need to consider how human life sustains itself after damage or destruction of critical infrastructure and key services, including in targeting decisions. However, militaries like the U.S. tend to take an "asset-oriented" perspective to damage to civilian objects, without due consideration for the indirect effects for civilians. This was identified as a clear gap by workshop participants.

[17] See International Network on Explosive Weapons, "Explosive Weapons: Protecting Civilians from the Use of Explosive Weapons in Urban Areas," *Article 36*, September 2018; Human Rights Watch, "Analysis of the Draft Elements of a Political Declaration on the Use of Explosive Weapons in Populated Areas," 6 February 2020; Reaching Critical Will, "Towards a political declaration on the use of explosive weapons in populated areas: states need to ensure that expressed commitments need to translate into real impacts on the ground."

[18] See for example U.S. comments on the draft political declaration on EWIPA, "Responses to draft declaration: United States," March 2020. For other States' responses, see: Reaching Critical Will, "Documents from the political declaration process on explosive weapons in populated areas."

Engaging States on reverberating effects also confronts legal and doctrinal obstacles. These include a limited focus on reverberating effects in law of war manuals; challenges in addressing strikes that may be lawful while still causing widespread human suffering; and varied interpretations of proportionality. Other sources of resistance from State militaries include the challenge of what constitutes "reasonable foreseeability" and the fact that a lack of ground presence during air campaigns hinders the ability to observe impacts of airstrikes.[19] At the technical level, planners and operational commands may not consult specialized experts such as urban planners, systems engineers, and cultural anthropologists who can best advise on the potential adverse effects of military operations.

> *"The few remaining hospitals are collapsing under a flow of hundreds of wounded lying in agony on the floors of wards and corridors [...] Doctors are performing brain and abdominal surgeries for the victims of bombing on the floors of the emergency rooms, for lack of available operating theatre."*
>
> Pablo Marco, MSF's operations manager in the Middle East, reporting on Syria

Challenges in informing humanitarian response

While parties to a conflict hold sole responsibility for preventing and minimizing direct and indirect civilian harm during their operations, research into the reverberating effects of operations can also inform humanitarian actors' work. Given the urgency of immediate response to widespread humanitarian need, humanitarian organizations often struggle to devote resources to systematic data collection, research and analysis, and long-term planning to address military operations' reverberating effects. Nor do they have the time to regularly digest dense academic research on the topic in the midst of a response. However, without these insights, humanitarian action may suffer from a lack of adequate preparedness and an inability to accurately predict need and prioritize activities in real-time, with resources allocated sub-optimally as a result.

Addressing Gaps

Innovations in data generation

Addressing the challenges to data collection described above requires a mix of high- and low-tech innovations to both generate and discover data that can be useful in understanding the reverberating effects of conflict. "High tech" innovations include remote sensing tools, such as the use of satellite imagery, to identify patterns of damage to civilian objects as well as reverberating effects such as environmental damage;[20] machine learning and other discovery tools to mine open-source intelligence (OSINT) from social media, media news sites, etc.; the use of

[19] Isabel Robinson antd Ellen Nohle, "War in cities: The 'reverberating effects' of explosive weapons," *ICRC Humanitarian Law and Policy blog*, 2 March 2017.

[20] See Wim Zwijnenburg, "Scorched Earth and Charred Lives: Human health and environmental risks of civilian operated makeshift oil refineries in Syria," *PAX for Peace*, August 2016. See also Wim Zwijnenburg, "Dying To Keep Warm: Oil Trade and Makeshift Refining in North-West Syria," *Bellingcat*, 24 April 2020.

machine learning to estimate unavailable data;[21] and decentralized crowdsourcing technologies or platforms to map data at the local level. Equally as important are "low-tech" approaches such as local surveys and witness interviews, cross-sectoral data-sharing processes, and investigative tactics to unearth existing government data. In particular, these tools should seek to capture the voices of populations most affected by armed conflict as well as document State strategies and decisions. Individually and combined, these tools can help provide both baseline and during-conflict data and insights in constrained environments. Simultaneously, technological tools are subject to a number of limitations, including coding bias and bias towards areas with higher mobile and other technology penetration. The use of technology in conflict-affected areas also presents ethical challenges such as privacy concerns, which must be mitigated.

Transparent and interoperable standards and methodologies

There is a clear need for a coherent set of standards guiding research on the reverberating effects of conflict. These standards should include norms and principles guiding research (e.g., committing to a "do no harm" approach, adherence to humanitarian principles, or norms for responsible data sharing); alignment of disparate definitions, coding schemes, and methodologies; and transparency around methodologies to encourage cross-sectoral learning.[22]

Among the most immediately actionable solutions to methodological challenges is the alignment of currently incompatible or unstandardized coding schemes. Individuals involved in the collection, categorization, and analysis of data express interest in exploring various organizations' coding decisions and definitions, identifying ways to make them compatible, and, where necessary, developing new, interoperable definitions, coding schemes, or typologies. For example, there is a clear need for an interoperable typology of civilian objects, which does not currently exist.[23] Such an effort would benefit from learning from past initiatives in other fields, such as attempts to standardize civilian casualty counting.[24]

Building the evidence base around reverberating effects also demands transparency in coding manuals and research methodologies. To facilitate methodological learning across institutions, researchers should publish lengthier and more detailed descriptions of their methodologies and research process.

Collaboration across and within sectors

First and foremost, effective collaboration among humanitarian practitioners, human rights organizations, academic researchers, and technical sectoral experts requires clarity of purpose. To best serve the varied purposes of those involved, this will most often involve a mix of timely insights to inform humanitarian action, including engagement with parties to conflict to limit harm in real time, as well as longer-term lessons that may be applied to military planning, humanitarian preparedness, and advocacy and accountability efforts.

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[21] Neal Jean, et al., "Combining satellite imagery and machine learning to predict poverty," Science, Vol. 353, Issue 6301, pp. 790-794, August 2016. DOI: 10.1126/science.aaf7894

[22] See International Committee of the Red Cross, *Professional Standards for Protection Work*, 11 June 2020, which can provide a starting point for the elaboration of standards needed to facilitate collaboration to strengthen the evidence base on the indirect effects of military operations.

[23] Some notable frameworks to draw upon include Mark Zeitoun and Michael Talhami, "The impact of explosive weapons on urban services: Direct and reverberating effects across space and time," *International Review of the Red Cross,* April 2016, Vol. 98, No. 1, 53–70; Jean Philippe Dross, Michael Talhami, Evaristo de Pinho Oliveira, Javier Cordoba, and Mark Zeitoun, "Urban services during protracted armed conflict: a call for a better approach to assisting affected people," *International Committee of the Red Cross,* October 2015; ICRC and InterAction, "When War Moves to Cities: Protection of Civilians in Urban Areas," Roundtable, May 2017.

[24] See Every Casualty, "Standards for Casualty Recording," November 2016; OHCHR, "Guidance on Casualty Recording," 2019; Airwars, "Methodology."

Real-time analysis requires real-time data sharing. As noted above, this can place a significant burden for information on humanitarian organizations as they work to respond to widespread humanitarian suffering. An improved process for collecting, requesting, and sharing field data, perhaps in the form of an inter-organizational "clearinghouse" or online platform, would enable better cross-sectoral collaboration.

All interdisciplinary efforts should seek to center the voices of the civilians most affected by conflict and its reverberating effects. Research teams should identify ways to incorporate and elevate the insights of conflict-affected populations, including ethical parameters, to ensure the safety and consent of those involved.

On a longer-term basis, practitioners and researchers should also undertake joint research and analysis on specific case studies, learn from documentation of the effects of past conflicts, and generate insights to promote better behavior on the part of armed actors and improved response on the part of humanitarians. Interdisciplinary research teams should include academic and humanitarian personnel with local expertise in specific conflict-affected sectors, including health, water and sanitation, energy, housing, and others. Developing a shared code of conduct for such joint research endeavors would be an important first step for these collaborations. Fundamentally, all interdisciplinary efforts should seek to center the voices of the civilians most affected by conflict and its reverberating effects. Research teams should identify ways to incorporate and elevate the insights of conflict-affected populations, including ethical parameters, to ensure the safety and consent of those involved.

"We came to pick up our things. It's impossible to live here, the shelling is almost every day. There's no water, no gas, nothing – no conditions for life. All the pipe systems are damaged. The apartment is on the contact line so it's right in the middle."

Natalia, Ukraine, reported by UNOCHA

Strengthening State policy and practice

Advocacy addressing the reverberating effects of military operations should demand that States take steps to understand better, learn from, and take responsibility for the totality of the harm caused by their operations. This may involve efforts to change the conduct of State militaries across the political, strategic, operational, and tactical levels, including by promoting changes in legal interpretation, doctrine, policy, and practice in the short, medium, and long term.

First and foremost, advocacy efforts must remind State parties to conflict of their obligations under IHL to protect civilians and civilian objects and to take concrete steps to minimize direct and indirect harm caused by their military operations. Beyond simple statements of commitment, operationalizing IHL obligations requires concrete investments in knowledge and expertise across the full cycle of military operations, including by continuously generating and absorbing new learning and systematically applying emerging good practice.[25]

[25] Talhami and Zeitoun write that "impact is more reasonably foreseeable than may commonly be thought, in the sense that the direct effects of explosives are well known and that the most important infrastructure is generally identifiable." See Talhami and Zeitoun, 2016: 54.

During the planning process, more must be done to anticipate and minimize the reverberating effects of conflict on civilians and communicate these costs to policymakers and decisionmakers at the political and strategic levels. The reverberating impacts of the wars in Afghanistan, Iraq, Syria, Yemen, and many other cases show that the indirect effects of conflict on civilians cannot simply be dealt with at the level of discrete operational planning choices. An understanding of the wide-ranging human costs of conflict, must be accounted for in political decisions to enter or avoid conflict. States should develop comprehensive national policies on civilian harm, including policy requirements to incorporate direct and indirect civilian harm into strategic and operational planning; minimize and mitigate all forms of civilian harm during operations; and assess, investigate, respond to, and learn from all forms of civilian harm when it occurs.[26] Militaries should develop new doctrine reflecting civilian harm considerations during military operations undertaken in populated areas. Policies and guidance should require that military forces make anticipatory assessments about the cumulative human tolls of their operations; collect their own information and data on damage to civilian objects and the reverberating effects of their operations, including from the use of explosive weapons with wide-area effects; and not rely on civil society organizations for this purpose. However, a proactive posture to gather data does not preclude militaries from reaching out to humanitarian and human rights organizations to engage on civilian harm risks, observed effects, and steps they can take to minimize harm. Indeed, this should be encouraged to help militaries develop a comprehensive understanding of the risks faced by civilians and absorb the perspectives and experiences of conflict-affected populations.[27]

Individuals involved in advocacy with States observe that they have never encountered a military that systematically considered potential reverberating effects in targeting.

State militaries should ensure that no-strike list processes are more comprehensive and updated in real time, and that intelligence preparation captures essential features of civilian objects and their relationship to civilian life. They should consider anticipated effects throughout the targeting cycle as well as in after-action assessments. While intelligence personnel must be trained to integrate information around civilian objects and foreseen effects, planning and targeting processes (including collateral damage estimation methods) should incorporate insights from city planning, economics, and cultural anthropology, among other fields, to understand and minimize risks around reverberating civilian harms. In some contexts, it may be appropriate for State militaries operating in the territory of conflict-affected States to liaise with functioning government entities and line ministries to obtain baseline information on the locations and infrastructural laydown of health, water, waste, electricity, installations of civilian objects, with the express goal of preventing and minimizing harm to these systems.

Finally, post-facto assessments and other processes should assess physical damage and destruction of civilian objects, evaluate the impacts of this damage on broader systems, and systematically consider the reverberating effects for civilian life. Findings of post-facto processes should be compared to pre-strike data in order to effectively learn from operations and adapt future methodologies to minimize and mitigate harm in the future. Policies on the acknowledgement of and amends for harm should apply to the damage and destruction of civilian objects as well as loss of life and injury.[28]

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[26] See: NGO Recommendations to DoD Policy on Civilian Harm, "Civil Society Guidance for a Model Policy: U.S. Department of Defense Policy on Civilian Harm," March 2020.
[27] See: NGO Recommendations to DoD Policy on Civilian Harm, "DoD Engagement with Humanitarian and Human Rights Organizations on Civilian Harm in U.S. Military Operations," July 2019.
[28] NGO Recommendations to DoD Policy on Civilian Harm, "Protection of Civilian Objects including Critical Infrastructure in U.S. Military Operations," November 2019.

In the United States, these policy changes can and should be enacted in the near-term via the forthcoming Department of Defense Instruction (DoD-I) on civilian harm. To increase transparency and accountability on the reverberating effects of U.S. military operations, civil society actors can pursue Freedom of Information Act (FOIA) requests for data and leverage different parts of the government (e.g., Congress, the Congressional Research Service, and Government Accountability Office) to understand U.S. government processes, raise the issue of reverberating effects in public discussions, and ultimately seek concrete changes in policy, practice, and behavior. The U.S. Congress also has an important role in legislating requirements to enhance understanding and learning from reverberating effects and conducting continuous oversight around the human impacts of U.S. military operations. Civil society in other countries should identify and pursue similar avenues for transparency, accountability, and policy and practice change.

Civil society actors and researchers can also pursue efforts to improve predictive capabilities on reverberating effects and civilian harm risks. One example includes the development of a predictive model of direct and indirect civilian harm by a group of practitioners and engineers, which may help relevant militaries in supporting their prediction and analysis tools to address the issue better.[29] The development of such new tools and capacities must consider the key ethical concerns identified above.

The role of non-state armed groups

Advocacy to strengthen the protection of civilian objects and minimize reverberating harms has traditionally focused on State security forces. However, non-State armed groups (NSAGs) have the same obligations as States to avoid and minimize damage to civilian objects and consider their reverberating effects. NSAGs, including those partnering with or supported by States, can contribute significantly to the damage and destruction of civilian objects and associated reverberating effects. State militaries partnering with and supporting NSAGs[30] should ensure that the political will and operational capability to avoid and minimize damage to civilian objects is incorporated into the partnership to minimize the reverberating effects of military operations on civilians.[31] Exemplifying good practice to shape the conduct of NSAGs, Geneva Call has leveraged education, training, and Deeds of Commitment to engage NSAGs on the protection of cultural heritage, the protection of medical care, avoiding use of landmines, and other humanitarian norms.[32] Examining the role of NSAGs in contributing to the protection of civilian objects or, conversely, to the damage of civilian objects and the reverberating effects of military operations, should form part of research objectives and efforts to strengthen policy and practice.

Recommendations and Next Steps

Based on the above insights, gleaned from desk research and expert convenings, the emerging community of interest around the issue of reverberating effects of military operations should pursue the following actionable recommendations:

1. Improve cross-sectoral data sharing by establishing a trusted process among humanitarian, human rights, development, academic, and other technical experts to manage data and research requests. This process should reduce the burden on field staff and ensure a timely feedback loop so that operational humanitarian and human rights organizations in the field know how their data is being used and have timely access to relevant insights generated using their data.

[29] Arizona State University Center on the Future of War, "Research."
[30] See NGO Recommendations to DoD Policy on Civilian Harm, "U.S. Partnered Operations and the Protection of Civilians," December 2019.
[31] For insight on engaging on with NSAGs regarding respect for norms and practical means of minimizing harm to civilians, see International Committee of the Red Cross, "The Roots of Restraint in War," 18 June 2018.
[32] Geneva Call, "Culture Under Fire: Armed Non-State Actors and Cultural Heritage in Wartime," October 2018.

2. Increase methodological transparency and collaboration by convening expert conversations around coding and other methodological decisions, including learning from similar initiatives in adjacent fields; and committing to publishing detailed descriptions of research methodologies and coding manuals.

3. Embark on joint research and analysis around select case studies to understand the short- and long-term reverberating effects of damage to and destruction of civilian objects, identify key lessons, and apply these lessons to future humanitarian responses as well as attempts to influence the conduct of armed actors. These case studies could be geographically or thematically based, centered around a particular country or around one sector traced through multiple conflicts. Country and regional case studies of particular interest to practitioners and researchers include Afghanistan, Bosnia, Cambodia, Colombia, Iraq, Lebanon, Palestine, the Sahel, Sri Lanka, Syria, Vietnam, and Yemen.[33] Case studies should solicit the perspectives of key decisionmakers during the conflict and those of the conflict-affected civilians who best understand the consequences of those decisions.

4. Improve the representation of those involved in conversations around reverberating effects to better reflect the insights of conflict-affected populations. Key experts include, first and foremost, conflict-affected communities, as well as the operational, country-based, and technical experts that understand critical infrastructure and sectoral dependencies (for example, food security, local economies, water supply, and sanitation); local academics and advocates in conflict-affected areas; and development experts and practitioners.

5. Advocate for military forces to systematically account for reverberating effects in their operations, and to invest in and use their own data in order to understand and minimize civilian harm in its totality. Military efforts to understand and minimize reverberating harm must be incorporated throughout the cycle of hostilities, including through planning, intelligence preparation, targeting, after-action reviews, and lessons learned. Accounting for harm should include real-time tracking by operational commands; damage assessments and after-action reviews; and comprehensive lessons learned studies, all aimed at informing near-term and future efforts to minimize and address reverberating effects.

In undertaking this advocacy, civil society should develop lessons from past policy advocacy experiences, including by sharing lessons across countries (e.g., advocacy around national protection of civilians policies) and thematic issue areas (e.g., global campaigns on landmines and cluster munitions and multilateral advocacy for a political declaration on EWIPA). Civil society advocates should also develop ethical parameters for this engagement to ensure that advocacy and information-sharing does not inadvertently contribute to harm and does not normalize systemic violence against civilians and civilian objects.

[33] InterAction and Stanford Health Policy, "Building the Evidence Base: Addressing the Reverberating Effects of Military Operations on Civilian Life", Virtual Workshop, May 17, 21, and 27, 2020.

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