



FRAGMENTS

EXPLOSIVE WEAPONS MONITOR QUARTERLY

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Bringing Victim Assistance Closer to the Point of Injury

Reducing preventable death and impairment among civilian casualties of explosive weapons

Hannah Wild, MD, General Surgery Resident, University of Washington and Project Lead, Explosive Weapons Trauma Care Collective (ExTraCCt)

Healthcare Devastated by the Use of Explosive Weapons in Mosul

The impact of explosive weapons on the provision of healthcare in Mosul, Iraq, 2017-2024

Camilla Molyneux, Researcher, Explosive Weapons Monitor

A NOTE FROM THE EXPLOSIVE WEAPONS MONITOR



As the use of explosive weapons in populated areas continues in conflict throughout the world, the dire humanitarian needs of civilians in these contexts are becoming clearer by the day. In Gaza, experts say that as many as 1.1 million people could face severe levels of starvation, death, destitution and acute malnutrition in the coming months. Civilians displaced by conflict in Sudan, spread across Ethiopia, South Sudan and elsewhere, are also facing severe hunger.

Food insecurity is but one reverberating effect of the use of explosive weapons in populated areas. This issue of *Fragments* explores another – the long-term impacts of the devastation of healthcare services. In the case of Mosul, Iraq, where one of the deadliest and most destructive urban battles since the Second World War was waged between October 2016 and July 2017 – civilians still face diminished healthcare capacity and access to care despite seven years of efforts to rebuild healthcare infrastructure damaged and destroyed by the use of explosive weapons.

The use and impact of explosive weapons in conflict puts extra pressure on the healthcare sector at a time when the need for it is the greatest. While weapons-related injuries increase the need for healthcare, damage and destruction of infrastructure also reduces the sector's capacity to provide it. This issue of *Fragments* explores how, during these times of diminished capacity, stakeholders working within the framework of the Political Declaration, in collaboration with health actors in conflict, can work in collaboration to ensure that all possible steps are taken to mitigate preventable death and impairment among civilian casualties.

All stakeholders have a responsibility to work to address the direct and reverberating effects of the use of explosive weapons in populated areas on civilians. The first meeting of endorser states to the Political Declaration, which takes place in less than a month's time, provides an opportunity for both cooperation and forward momentum in these efforts.

A handwritten signature in black ink that reads 'Katherine'.

Katherine Young
Research & Monitoring Manager, Explosive Weapons Monitor

FRAGMENTS: EXPLOSIVE WEAPONS MONITOR QUARTERLY SERIES

Fragments – the Explosive Weapons Monitor Quarterly Series – is a collection of articles that address topics related to the use of explosive weapons in populated areas and contribute research to or report on developments and news relevant to this issue area. *Fragments* aims to reach a combination of specialised audiences familiar with the issue of explosive weapons in populated areas, including those affected by explosive weapons use, as well as the community of practice working to address the impacts of explosive weapons through the Political Declaration on the Use of Explosive Weapons in Populated Areas.

The Explosive Weapons Monitor is a research initiative of the International Network on Explosive Weapons (INEW). It conducts research and analysis on harms from and practices of explosive weapons use in populated areas and monitors universalisation and implementation of the Political Declaration on the Use of Explosive Weapons in Populated Areas.

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On the cover:

Ibn Sina Hospital Complex captured by UNMAS in West Mosul, Iraq, May 2018.

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BRINGING VICTIM ASSISTANCE CLOSER TO THE POINT OF INJURY

REDUCING PREVENTABLE DEATH AND IMPAIRMENT AMONG CIVILIAN CASUALTIES OF EXPLOSIVE WEAPONS

HANNAH WILD, MD, GENERAL SURGERY RESIDENT, UNIVERSITY OF
WASHINGTON AND PROJECT LEAD, EXPLOSIVE WEAPONS TRAUMA
CARE COLLECTIVE (ExTraCCt)

Stakeholders working within the framework of the Political Declaration, in collaboration with health actors in conflict, have a responsibility to ensure that all possible steps are taken to mitigate preventable death and impairment among civilian casualties from the use of explosive weapons in populated areas. This article synthesizes the direct effects of the use of explosive weapons in the form of death and injury among civilian populations, and highlights opportunities for enhanced coordination between health and protection stakeholders to address and mitigate this harm.

Introduction

Contemporary warfare in the 21st-century has been characterized by the increased use of explosive weapons in populated areas, with significant impact on civilian populations. Whereas conflict-related casualties were historically predominantly male combatants, the effects of the use of explosive weapons in populated areas are indiscriminate, with an equal if not greater toll on women, children and the elderly.

Between 2011 and 2016 in Syria, for example, 75 percent of deaths among women and 29 percent of deaths among children were caused by the use of explosive weapons in populated areas, including shelling and aerial bombardments.¹ Over this period, deaths among women quadrupled, and by 2016, approximately one quarter of casualties of explosive weapons used in populated areas were children.

These patterns of warfare are not unique to Syria, but rather are a feature of modern urban conflict. Based on casualty data from the war in Gaza since 7 October 2023, children are projected to represent an even greater proportion of trauma-related fatalities (34 percent), with nearly half (43 percent) among women.² Though these data – derived largely from Ministry of Health registries – do not capture the quantitative proportion of deaths due to explosive weapons use, study investigators reported the majority of conflict-related trauma to be attributable to bombardments in densely populated areas. While the demographics of many resource-constrained countries affected by conflict are characterized by increased proportion of children and youth, these trends are nonetheless highly concerning for the toll of explosive weapons on civilians. These figures do not encompass the far-reaching indirect and reverberating effects of the use of explosive weapons in populated areas.

Blast injuries, including those caused by the use of explosive weapons, are a unique entity. Unlike penetrating trauma from gunshot wounds, blast mechanisms frequently inflict multidimensional injuries (i.e., concomitant mangled extremity/traumatic amputation, traumatic brain injury, thoracoabdominal trauma, and thermal injury or burns) with high injury severity scores.³ Such severe polytrauma can quickly overwhelm health systems weakened by conflict.

A view of a hospital damaged in the Russian-Ukrainian conflict in the city of Volnovakha, Donetsk Oblast, Ukraine, 12 March 2022.

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The Explosive Weapons Trauma Care Collective (ExTraCCt)'s systematic review of civilian casualties in 21st-century warfare identified vulnerable patient subpopulations with disproportionately high rates of death. In some cases, these rates were approximately four times higher than the overall cohort.⁴ These populations are predominantly child casualties of blast injury (specifically children under five years old and those with traumatic brain injuries), and patients with war-related burns.⁵ Each of these injury patterns is typical of those caused by the use of explosive weapons in populated areas.

Focusing on the direct effects of the use of explosive weapons in populated areas and the immediate consequences of blast injury, this article provides an overview of the potential for enhanced coordination between stakeholders to the ongoing process of work within the framework of the Political Declaration (including humanitarian mine action) and health actors to mitigate preventable death and impairment among civilian casualties.

The Political Declaration and casualty care

The Political Declaration on Strengthening the Protection of Civilians from the Humanitarian Consequences Arising from the Use of Explosive Weapons in Populated Areas, adopted by more than 80 countries in November 2022, refers specifically to the “blast and fragmentation effects” that “cause deaths and injuries, including lifelong disabilities,” (Section 1.3) and includes the commitment to “provide, facilitate, or support assistance to victims” (Section 4.5).⁶

The use of explosive weapons in populated areas in conflict settings causes significant death and injury among non-combatants.⁷ Though global estimates of explosive weapon-specific fatality rates are limited, estimates from casualty data of civilian victims of explosive ordnance demonstrate that at present, approximately 40 percent die of their injuries.⁸ This fatality rate is up to twenty times higher than that observed among blast-injured patients at military treatment facilities or high-resource civilian centers.⁹ This discrepancy in outcomes suggests that a substantial proportion of death among civilian victims of explosive ordnance and explosive weapons could be prevented with adequately resourced trauma care.

Though conflict and low-resource settings are by no means synonymous, certain challenges to accessing care are shared between environments. A systematic review of trauma systems development in low- and low-middle income countries found that approximately 80 percent of deaths in this context occur in the prehospital setting (for example, care provided prior to reaching a health facility).¹⁰ It is therefore reasonable to assume that a majority of preventable death among civilian casualties in resource-constrained conflict settings likewise occur in the prehospital environment.

Victim assistance in mine action has historically emphasized holistic, long-term rehabilitation (including, for example, physical, psychosocial and socioeconomic rehabilitation) in light of the complex and lifelong needs of victims.¹¹ Yet if the majority of conflict-related deaths occur prior to reaching a health facility, under-explored potential exists to increase survival by expanding victim assistance frameworks closer to the point of injury. Numerous opportunities exist to collaborate with health actors to strengthen immediate post-injury care. However, to date these have not been fully explored in a structured manner.

Understanding civilian injury epidemiology in conflict

Attempts to increase survival from traumatic injury have historically focused on first understanding the causes of preventable death. Over the course of the wars in Iraq and Afghanistan, the United States military restructured its trauma care system to respond to the relatively high proportion of preventable prehospital death among military servicemembers, resulting in what ultimately came to be the Joint Trauma System (JTS).¹² The military guided these changes by conducting continuous analysis of casualty data through the Joint Trauma Theater Registry (JTTR), thereby obtaining a clear picture of the causes of preventable death for those killed in action – most commonly extremity hemorrhage, followed by airway emergencies.¹³

Unfortunately, no such standardised registry or data source exists for humanitarian care in conflict. Available data fare frequently ad hoc with a lack of standardisation, rendering it challenging to draw clear conclusions about injury epidemiology among civilians in conflict, including casualties caused by the use of explosive weapons in populated areas.

Humanitarian trauma care differs from trauma care rendered to military casualties for many reasons. First, patients are not a homogenous population of healthy, predominantly male individuals ages 30-40. They encompass a demographic spectrum from children to the elderly, pregnant women and patients with pre-existing impairments.

Second, civilian casualty care occurs in the context of resource constraints that are dramatically different from those encountered by military personnel. Whereas military medical personnel have access to clearly established evacuation chains including air capabilities leading to the concept of the “Golden Hour” in trauma (for example, that immediate resuscitative trauma care provided within the first 60 minutes after injury are critical to survivability), in a civilian context prehospital transport may occur by any means available, including private vehicle, donkey, bicycle or foot.¹⁴ Casualty evacuation using these ad hoc means may take anywhere from multiple hours to multiple days. For example, one analysis of civilian conflict casualties in Kabul, Afghanistan, found that only 5.8 percent reached a health facility within the proverbial golden hour.¹⁵

Translating evidence-based practices from trauma care in low-resource settings to the care of casualties caused by the use of explosive weapons in populated areas

The challenges facing high-quality trauma care for civilian conflict casualties are significant, including the above-described gaps in casualty data, severe resource limitations and security constraints, including the deliberate targeting of and indiscriminate impact on humanitarian workers and health facilities.¹⁶

In the face of such challenges, what meaningful and concrete steps can be taken to improve outcomes among civilian casualties of the use of explosive weapons in populated areas and explosive ordnance in conflict settings? How can collaborative engagement between stakeholders be leveraged to increase the reach of such interventions?

With these two questions in mind, in 2022 ExTraCCt was established as a collaboration between researchers at the University of Washington's Department of Surgery and the United Nations Mine Action Service (UNMAS). The initiative's objective was to identify opportunities for enhanced coordination between humanitarian mine action and health actors in conflict with a shared goal of minimizing preventable death and impairment among civilian casualties of explosive weapons.

Though originally identified within the context of mine action, the strategies identified represent concrete opportunities to operationalize the commitments of the Political Declaration.

Numerous interventions have been demonstrated to reduce trauma-related mortality in low-resource settings. Though adaptation is required for deployment in conflict settings, many have relevance to resource-constrained conflict environments. Workstreams to standardize and promote such interventions exist among multilateral actors like the World Health Organization (WHO) as well as local and national health stakeholders in conflict-affected countries (for example, national societies of the International Federation of the Red Cross and Red Crescent, Ministries of Health, medical student networks and civil society organizations).

Innovation not in technical guidance but rather in partnerships and implementation strategies is needed to ensure the most affected populations are reached. To provide structure to the dialogue around coordination between humanitarian mine action and health actors, ExTraCCt conducted multiple phases of background research to identify evidence-based trauma care interventions with demonstrated potential to reduce mortality in resource-constrained settings that held relevance for casualties of explosive violence.



A view of damage after Israeli Defense Forces struck the pediatric department of Nasser Hospital in Khan Younis city, Gaza, 17 December 2023.

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Though many of these interventions may seem simple, such as trauma care trainings and standardised checklists for casualty resuscitation, numerous advances in care in high-resource settings have also been predicated on simple interventions. To provide only one example, layperson first responder trainings represent an underutilized way to bring lifesaving trauma care closer to the point of injury. This is analogous to the approach adopted by the United States military in its Tactical Combat Casualty Care or T-CCC, wherein all military personnel – not just those with medical backgrounds – were trained in immediate lifesaving aid. T-CCC has been widely adopted and attributed with a significant reduction in mortality among military servicemembers.¹⁷

In a context more relevant to civilian casualties, in the 1990s the Tromsø Mine Victim Center conducted layperson first responder and prehospital trainings in landmine-affected regions of Iraq and Cambodia.¹⁸ Over a five-year period, trauma-related mortality within the intervention area was reduced from approximately 40 to 15 percent. Though these trainings cannot supplant a full spectrum of trauma care and are only a means of increasing survival to reaching a trained provider, the full potential of these trainings are underexplored.

The WHO Community First Aid Responder (CFAR) training represents one layperson first responder training designed to be appropriate for resource-constrained environments.¹⁹ Integration with explosive ordnance risk education activities – such as one that will soon be piloted with Mines Advisory Group (MAG) among communities affected by improvised explosive devices (IEDs) in the Sahel – may significantly reduce preventable death.

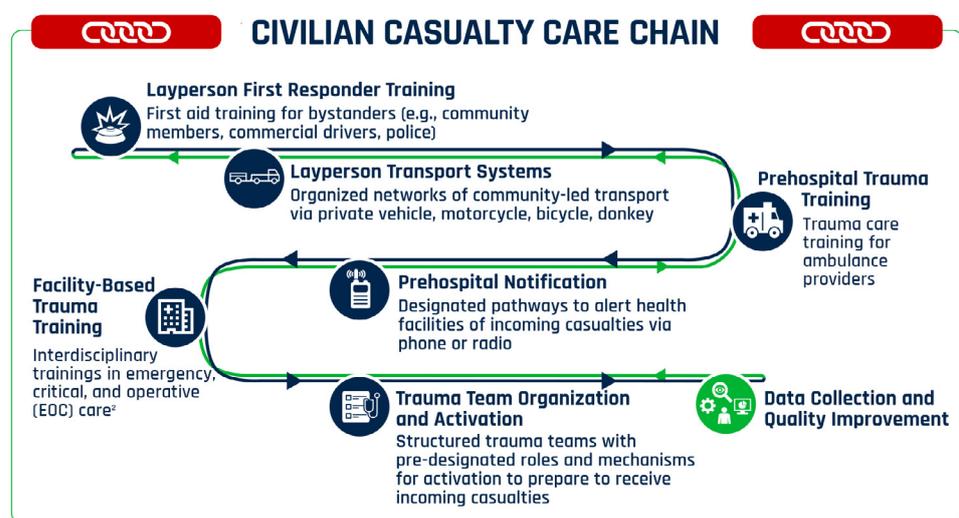
Further opportunities are elaborated elsewhere as links in the Civilian Casualty Care Chain, or C-CCC (see Figure 1). Crosscutting all phases is the opportunity for improved casualty data collection and meaningful operationalisation of these data to enhance understanding of injury epidemiology to target interventions to the highest-risk populations, assess quality of care, benchmark impact of quality improvement initiatives, and to strengthen documentation of human rights violations.

Building off the United Nations Institute for Disarmament Research (UNIDIR) and Explosive Weapons Monitor workshop on Improving Data Collection Provisions of the EWIPA Political Declaration held February 29-March 1, 2024 in Geneva, significant potential exists for collaboration between stakeholders to the ongoing process of work within the framework of the Political Declaration and health stakeholders to harmonize casualty data and elucidate pathways for secure data sharing as a basis for policy and advocacy efforts.

Conclusion

Until the Political Declaration takes hold and injuries from explosive weapons can be more widely prevented, there is a shared responsibility to ensure all steps are taken to mitigate preventable civilian death and impairment among those affected. While high-level policy dialogues and implementation of the Declaration proceed, stakeholders in EWIPA and victim assistance in mine action, in collaboration with health actors in conflict, must take up this responsibility. The Explosive Weapons Trauma Care Collective seeks to engage stakeholders from both sectors to leverage novel cooperation to reduce harm related to the direct effects of EWIPA.

Figure 1 - Links in the Civilian Casualty Care Chain (C-CCC)



Naun Project (ccby3.0)



Main building of the Ibn Sina
Hospital Complex in Mosul,
Iraq, 2018.

© Photo UNMAS

HEALTHCARE DEVASTATED BY THE USE OF EXPLOSIVE WEAPONS IN MOSUL

THE IMPACT OF EXPLOSIVE WEAPONS ON
THE PROVISION OF HEALTHCARE IN MOSUL,
IRAQ, 2017-2024

CAMILLA MOLYNEUX, RESEARCHER,
EXPLOSIVE WEAPONS MONITOR

The battle for Mosul, Iraq – one of the most destructive urban battles since the Second World War due in large part to the use of explosive weapons by all parties to the conflict – devastated the city’s healthcare system. This article explores the long-term impacts of the use of explosive weapons on the provision of healthcare in Mosul from the end of the battle through present, highlighting the evolving healthcare needs of civilians at different points in the last seven years.

Introduction

The battle for Mosul, Iraq – waged from October 2016 to July 2017 – has widely been referenced as one of the deadliest and most destructive urban battles since the Second World War.²⁰ For nine months, Iraqi security forces, backed by a US-led Coalition, fought to dislodge the Islamic State, also known as ISIS, ISIL and Daesh, from Mosul. The group had seized control of the city in June 2014, amidst rising instability in Iraq and Syria.²¹ In August 2014, the US-led Coalition began conducting airstrikes against ISIS. These were conducted by the Coalition's military contingent of 14 states, including Belgium, France, the Netherlands, Saudi Arabia, Türkiye and the United Kingdom.²²

The battle for Mosul was characterised by widespread use of explosive weapons by all actors. The US-led Coalition's air and artillery units fired more than 29,000 munitions at the city. Local Iraqi forces also frequently deployed explosive weapons. Iraqi armed forces, for example, engaged fighter jets and attack helicopters, artillery, mortars and rockets, while the Iraqi Federal Police reportedly used improvised rockets known as IRAMs in western Mosul. ISIS also deployed artillery, mortars and improvised explosive devices (IEDs) widely in Mosul, including more than 700 vehicle-borne IEDs, according to Coalition officials.²³

The use of explosive weapons in Mosul has had lasting impacts on the provision of and access to healthcare. Drawing on available data, this article will highlight healthcare needs and services at different points in time since the end of the battle, almost seven years ago. This can serve as an example of some of the foreseeable reverberating effects of explosive weapons use in cities on healthcare.

Death and injury from the use of explosive weapons in Mosul

The extensive use of explosive weapons in Mosul caused significant civilian death and injury. There is no definitive number of civilians killed as parties to the conflict did not engage in comprehensive civilian harm documentation. An analysis by the Associated Press (AP) in 2017 estimated that between 9,000 and 11,000 civilians were killed during the nine month-long battle. At least a third of the civilians killed were attributed to ISIS by the AP. Similarly, the media outlet found that at least one third were killed by the use of airstrikes, artillery fire and mortar rounds by US-led Coalition forces or Iraqi forces. The AP analysis referenced reports by the Health Ministry, which described the majority of these civilian bodies as “crushed” - likely caused by the weight of collapsed buildings hit by explosive weapons.²⁴

The number of people permanently injured from the use of explosive weapons in populated areas far exceeded the number of civilians killed, the Chief Executive of Humanity & Inclusion UK remarked following a visit to Mosul in 2021. Many people permanently injured in Mosul would require long-term medical care, including almost five thousand amputees registered with the Mosul Rehabilitation Centre as of 2018.²⁵

The United Nations Office for the Coordination of Humanitarian Affairs (OCHA), reported that 20,000 severely wounded people were referred to hospitals during the battle.²⁶ Beyond physical injury, the World Health Organization (WHO) estimated at the end of 2018 that nearly two percent of people affected by the conflict suffered from “serious mental health problems,” in particular extremely vulnerable women, children and the elderly.²⁷ Although not all of these injuries were caused by explosive weapons, their prevalence suggests they caused a high proportion of harm.

Increased burden on the healthcare sector: impacts of the use of explosive weapons in conflict on the provision and need of healthcare in Mosul

The use and impact of explosive weapons in conflict puts extra pressure on the healthcare sector at a time when the need for it is the greatest. Whilst weapons-related injuries increase the need for healthcare, damage and destruction of infrastructure also reduces the sector's capacity to provide it. This can cause avoidable deaths, disabilities and diseases for months or years into the future.

In Mosul, widespread use of explosive weapons in populated areas contributed directly to these stresses. Damage and destruction to and around healthcare facilities impacted the provision of healthcare, civilians' access to facilities and the supply of drugs and medical equipment. Capacity and provision was also impacted by the injury, death or displacement of healthcare personnel.

In the case of one Mosul hospital, the exhaustive damage caused by the battle stopped its provision of services altogether:

“The destruction of Mosul Ibn Sina Teaching Hospital symbolises the collapse of the healthcare system caused by the war. The impacts are widespread and long-lasting with the increased pressure on remaining health facilities meaning people suffer for longer before receiving treatment or surgery, while chronic diseases worsen with time.”²⁸

- International Committee of the Red Cross (ICRC)

The destruction of Ibn Sina, as well as widespread damage to other hospitals and primary healthcare centres, dramatically reduced the capacity of Mosul's healthcare providers to treat people.

Weapons-related injuries and the added demand on healthcare: Mosul General Hospital

A case study of Mosul General Hospital, albeit limited in scope, illustrates the additional burden put on healthcare systems by the use of explosive weapons. An analysis of admissions between 6 June and 1 October 2017 showed 44.9 percent were weapons-related. The majority were from explosive weapons, identified as “blast/fragment” injuries in hospital records. More than one third (35.5 percent) of the weapons-related injuries were to children.²⁹

Whilst the data showed a declining trend in weapons-related injuries during the study period, it is notable that the hospital received patients with weapons-related injuries more than two months after the conclusion of the battle for Mosul.³⁰ Indeed, the ICRC reported that for months after the end of fighting, civilians in Mosul required life-saving surgery from injuries caused by unexploded ordnance and booby traps placed by ISIS.³¹ Médecins Sans Frontières (MFS) similarly reported a shift from weapons-related wounds to mine injuries in the first year after the battle.³²

Importantly, the data from the Mosul General Hospital study also shows that the majority of admissions (55.1 percent) were due to non-weapon-related conditions, serving as a reminder of the continued demand for treatments of these conditions during and in the immediate aftermath of conflict.



Mujbil Mizher Muhammad, a shepherd injured by an IED while working in September 2017, entering his house in Mosul, Iraq, 17 October 2022.

© T. Nicholson / Humanity & Inclusion

Thousands of people were seriously wounded during the conflict in Mosul, including from the use of explosive weapons, with a significant proportion facing life-changing injuries and permanent disability.³³ Many required specialised care, including urgent and emergency care, long-term follow-up, rehabilitation, mental health and psycho-social support. Yet, in Mosul, limited capacity and high costs, caused in part by the damage and destruction of healthcare facilities from explosive weapons, posed serious barriers to adequate and timely treatment.³⁴

In July 2019, Humanity & Inclusion's Middle East Director said that "[t]housands of victims still await treatment," including patients that had been waiting for prosthesis for more than a year.³⁵ A survey to identify people with disabilities conducted the following year identified 1,300 'new' people with disabilities, 61 percent of which were in need of assistive devices and required wheelchairs.³⁶

Moreover, civilians continued to experience weapons-related injuries after fighting had stopped. As the end of the battle approached its one-year mark, MSF reported that dangerous living conditions, caused by the widespread destruction of housing and other infrastructure, posed a growing risk to civilians' health and heightened the need for healthcare facilities.³⁷ As more people returned to Mosul, a growing number were seeking emergency healthcare due to injuries obtained from living in post-conflict environments. Indeed, this was the cause of 95 percent of trauma cases received at a MSF hospital in western Mosul in May 2018. These trauma cases - including injuries from collapsing buildings, falling from unsafe structures and falling debris - show some of the indirect impacts explosive weapons use in populated areas has on civilian life over time.³⁸

Assessing the impact of explosive weapons on healthcare infrastructure and provision in Mosul

The use of explosive weapons in Mosul had a severe impact on access to, and the availability and quality of, healthcare. The nine month-long battle saw the damage or destruction of nine out of the city's thirteen hospitals. The ICRC reported that the number of hospital beds dwindled from nearly 2,800 before the battle, to just one hundred directly following its conclusion. Six years later, only 1,200 beds were available, some 40 percent of pre-battle numbers.³⁹

The United Nations Mine Action Service (UNMAS) Chief of the Mine Action Programme in Iraq told the author that "most of the [city's] healthcare infrastructure had been destroyed or was not accessible," and that in western Mosul it was "more or less non-existing."⁴⁰ Ibn Sina Teaching Hospital, Mosul's main healthcare provider for over three decades and Iraq's second largest hospital complex, was damaged so severely that healthcare services stopped entirely.⁴¹ The complex, which had been used as a base by ISIS fighters, was heavily bombed by Coalition forces. The levels of contamination from IEDs and other unexploded ordnance was very high, especially in west Mosul, with UNMAS clearing some 1,500 explosive items from the hospital complex alone.⁴²

"When we first came here, it was a pile of debris, a barren place, there was nothing we could use," said Shatha Mahmood, a Senior Pharmacy Assistant, of her first visit to the hospital after the battle. The hospital complex which had once provided quality healthcare for a million people was unusable, and with it, a range of free or affordable services it had provided, from urgent and emergency care and operations, to cardiology,

The same hospital room before and after the battle for Mosul. Ibn Sina Hospital Complex, Mosul, Iraq. © Photo UNMAS



neurosurgery and maternal, neonatal and paediatric care. To this day, the site remains one of construction, with parts of the hospital's services being offered in temporary facilities elsewhere in the city.⁴³

The explosive hazard contamination and immense amounts of rubble - estimated at some 7.5 tonnes - were major obstacles to assessing and rehabilitating healthcare infrastructure and restoring the provision of healthcare in Mosul, according to the UNMAS Chief of the Mine Action Programme in Iraq. A particular challenge was the unprecedented level of "three-dimensional" contamination - explosive hazards could be found anywhere in the urban environment, not just buried in the ground, but also under rubble, attached to household appliances, or concealed inside walls or children's toys.

The cost of clearing cities of mines and unexploded ordnance comes at an estimated cost of six times that of rural settings, according to Humanity & Inclusion.⁴⁴ In 2017, Mosul's governor assessed that it would cost US\$ 50 billion to remove explosives and rebuild Mosul over the five years following the battle.⁴⁵

The slow process of rebuilding and rehabilitating a city's healthcare system

Rebuilding Mosul's healthcare infrastructure, increasing its capacity and providing affordable, quality services has been slow. According to healthcare experts with knowledge of Mosul, the city is still years from reaching the capacity it had before the battle.⁴⁶ This, despite Iraq being the recipient of the most successful and well-funded international appeal for humanitarian assistance globally from 2017 to 2020, with 95 percent of funding requirements met.⁴⁷

From the beginning of the battle for Mosul, local healthcare personnel and international partners rallied to provide emergency and trauma healthcare for civilians. After the battle, work rapidly began to rehabilitate primary healthcare and provide provisional locations for emergency hospital services.⁴⁸ However, the scale of the damage to Mosul's healthcare infrastructure was significant. A 2017 assessment by the United Nations Development Programme (UNDP) established that sixteen primary healthcare centres and three hospitals in east Mosul had differing degrees of damage, whilst in western Mosul, sixteen primary healthcare centres and five hospitals were all still in various states of disrepair.⁴⁹

One year after the end of the military campaign, MSF reported that the healthcare system was in ruins, with a large gap between needs and available services. The number of hospital beds was unimproved, standing at only 30 percent of the pre-offensive capacity. For a population of 1.8 million people, Mosul had less than 1,000 hospital beds, half of the internationally recognised capacity required to ensure the minimum standard of healthcare provision in a humanitarian situation.⁵⁰

MSF's Head of Mission in Iraq said that "[e]mergency room services and surgical, oncology and burns facilities are urgently needed, as well as medical equipment and a steady and affordable supply of medication." They added that every day, thousands of Mosul's inhabitants were struggling to access healthcare.⁵¹ Needs for mental health services, follow-up surgery, pain management and physiotherapy for wounded civilians were also in high demand.⁵²

In the years that followed, accessing healthcare continued to be a struggle for many. In 2021, limited availability and cost were cited by Humanity & Inclusion as notable obstacles.⁵³ That same year, a local official in Mosul told PAX, a Dutch peace organisation, that 80 percent of the city's healthcare facilities continued to operate out of temporary locations.⁵⁴

In 2022, five years after the end of military operations, MSF identified limited improvement, but emphasised that the need for medical care remained high. Many of the damaged facilities had yet to be fully renovated and made fit for use, and medical supplies were in shortage. Whilst hospitals had reopened in temporary structures and caravans, thousands of families found it difficult to receive quality, affordable care.⁵⁵

Across Mosul's healthcare providers, a pattern of decreased capacity and increased demand continued six years after the end of the war. For example, before the battle in 2016, the Ibn Sina Teaching Hospital received up to 21,000 patients per month for operations and treatments. During this time, its 600 beds were often occupied, and 800 to 900 patients were referred to the hospital daily. Six years later, in 2023, the number of daily referrals had increased to 3,000, whilst the hospital's capacity was reduced by 90 percent. The hospital's original site remained in ruins, the ICRC said in December of 2023, with temporary locations operating at 10 percent of its pre-battle capacity.⁵⁶

Yet, during the past seven years, significant efforts have been made to better Mosul's healthcare provision, and it is slowly improving. Today hospitals and primary healthcare centres are functioning and providing basic services, including immunisation, curative care and treatment for non-communicative diseases, a healthcare professional told the author. However, secondary healthcare services, they estimated, are only able to provide around half of the services needed for the population they serve. Whilst lifesaving services such as emergency reception rooms are up and running, operating theatre capacity and other tertiary treatment remains limited.⁵⁷

Efforts are underway to rebuild Mosul's hospitals. The site which housed the Ibn Sina Teaching Hospital is currently being cleared in preparation for reconstruction. The IQD 300 billion project (approximately US\$ 230 million) is expected to be complete in 2027. The timely completion of the hospital was described by the ICRC in late 2023 as "a matter of life and death," as Mosul continues to operate at a significantly reduced capacity.⁵⁸

Conclusion

Mosul may reach its pre-battle healthcare provision capacity within the next three to five years, a healthcare professional with insight into its rehabilitation said. This, however, will require significant commitment from the Iraqi government and additional financial and implementation support from external actors.⁵⁹

If this estimation is accurate, it will take a decade, at a minimum, to restore the capacity largely lost due to widespread use of explosive weapons during the battle for Mosul. The lack of timely, quality care for a large proportion of Mosul's population over more than ten years will have had a significant impact on current and future health outcomes.

The damage and destruction of Mosul's healthcare services, the time- and resource-intensive process of rehabilitating and rebuilding infrastructure and provision, an unknown number of lost appointments and treatments, and the wider effect this has had on people's health and wellbeing, speaks to the continued impact of the use of explosive weapons years following the end of conflict. Moreover, the battle for Mosul illustrates the foreseeable damage caused by the use of explosive weapons in populated areas and underscores the need to avoid such use.



The Old City of Mosul in November 2022, five years after the end of the battle. Mosul, Iraq, 19 October 2022.
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The Explosive Weapons Monitor is a research initiative of the International Network on Explosive Weapons (INEW). It conducts research and analysis on harms from and practices of explosive weapons use in populated areas and monitors universalisation and implementation of the Political Declaration on the Use of Explosive Weapons in Populated Areas.

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