RESEARCHING THE IMPACT OF ATTACKS ON HEALTHCARE

Conceptual issues and methodological approaches to evaluating the wider and longer-term impact of attacks on healthcare in conflict

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Abbreviations

ANC	Antenatal Care
CA	Catchment Area
COVID-19	Coronavirus Disease -19
DD	Difference-in-Difference
ICC	International Criminal Court
ICRC	International Red Cross Committee
IHL	International Humanitarian Law
IHRL	International Human Rights Law
ITS	Interrupted Time Series
MSF	Médecins Sans Frontières
NGO	Non Governmental Organisation
PHR	Physicians for Human Rights
PTSD	Post-Traumatic Stress Disorder
RIAH	Researching the impact of Attacks on Healthcare
SAMS	Syrian American Medical Society
SHCC	Safeguarding Healthcare in Conflict Coalition
SSA	Surveillance System on Attacks on Healthcare
UN	United Nations
UCDP	Uppsala Conflict Data Program
WHO	World Health Organization

1. Introduction

Many of today's armed conflicts are marked by systematic violence, threats and interferences against healthcare providers, healthcare facilities, transport and patients. These attacks deprive people of urgently needed medical care and weaken the systems that are needed to ensure the health and well-being of the community over time. While International Humanitarian Law (IHL) mandates that all State and non-State parties to an armed conflict protect the wounded and the sick, healthcare personnel, and their facilities, transports and equipment, these laws are frequently violated with little accountability. Documenting incidents of violence and their consequences can bolster efforts to prevent them and mitigate their impacts.

Several organisations have made strides in developing methodologies, initiating programs and recruiting stakeholders in the documentation of attacks across the globe. The World Health Organization (WHO) Surveillance System on Attacks on Healthcare (SSA), which aims to document the frequency and nature of attacks on healthcare in countries facing emergencies, recorded 1,022 attacks on healthcare in 11 countries in 2019 alone (WHO, 2020). Other organisations, including the Safeguarding Healthcare in Conflict Coalition (SHCC), the Syrian American Medical Society (SAMS), Physicians for Human Rights (PHR), and Insecurity Insight have documented the scale of attacks on healthcare. They have also been the subject of campaigns by the International Red Cross Committee (ICRC) through the 'Healthcare in Danger' initiative and Médecins Sans Frontières (MSF) via its 'Medical Care under Fire' project.

Research on attacks on healthcare has aided in identifying new ways of systematically and reliably collecting data on attacks. Haar, Rubenstein and colleagues, in collaboration with the Backpack Health Worker Team in Myanmar, developed a systematic mechanism to collect data on attacks on healthcare directly from the field (Haar et al., 2014) and implemented it in 2016 via a mobile app in Syria in collaboration with the SAMS (Haar et al., 2018). The health cluster in Gaziantep, Turkey, which coordinates the humanitarian health activities of actors operating in Syria, piloted and implemented a similar tool between November 2015 and December 2016 (Elamein et al., 2017). All health cluster members with staff physically present in Syria were invited to collect and report primary data, in real-time, on incidents of attacks on healthcare using a standardised electronic data collection instrument. The WHO SSA relies on a similar data collection system and there is an 'attacks on healthcare' focal point at each reporting WHO country office (WHO, 2018).

Documenting the attacks and their direct and immediate violence, including destruction of health infrastructure and transport, and fatalities among healthcare personnel and patients, is critically important. Beyond keeping a record, there is a need to explore and

understand the broader *impacts* of these attacks. The impacts on the health system, including access to, availability, quality and utilisation of healthcare services, as well as on the population served, including health outcomes and psychosocial effects are not, as of yet, well understood in any context. Improving understanding would include documenting the adaptive measures organisations implement to keep health services functioning despite attacks and drawing lessons to design more effective mitigation strategies. Impacts outside of the public health paradigm, such as economic and societal costs, effects on medical ethics, and on international or national law, are even less studied but also important to illustrate the true sequelae of violence against healthcare.

This working paper, written by researchers of the Researching the Impact of Attacks on Healthcare (RIAH) project, aims to present a rigorous discussion of the conceptual issues and methodological considerations related to attacks on healthcare and their impacts. We will update the document over the course of the five-year study (2019-2023) as we progress on several case studies. Chapter 2 describes the methods and process, Chapter 3 discusses how attacks on healthcare are defined, Chapter 4 presents a conceptual framework for studying the impacts of attacks on healthcare and Chapter 5 examines potential methodologies to identify, assess and better understand the wider and longer-term impact of attacks against healthcare in armed conflicts. Chapter 6 concludes.

2. Methodology

This working paper is based on a literature review, internal discussions among the RIAH research consortium, and external consultations conducted with experts in the field.

We first carried out a literature review of peer-reviewed publications and grey literature, which documented the wider and longer-term impacts of attacks on healthcare in conflict settings in order to list and analyse the conceptions of 'attacks on healthcare in conflict' and their impacts, and to study potential methodologies. The discussion is based on a systematic review of research on attacks on healthcare of 45 papers published between 1983 and 2019 (Haar, Read et al forthcoming paper) and analysis of the websites, reports and other documents related to key actors that have documented or continue to actively document attacks on healthcare and report their taxonomy, methods and findings (these include the ICRC, the WHO, and the SHCC). In exploring potential research methodologies to document or measure the impact of attacks on healthcare, we noted that most of the literature covered immediate consequences (e.g. number of health facilities/ambulances attacked, number of casualties). While there were a handful of quantitative studies focusing on retrospective analysis of facility-level data, authors and humanitarian or human rights organisations documented the medium- and long-term impacts primarily with qualitative methodologies, more specifically with in-depth interviews of healthcare workers and service-users affected by attacks on healthcare.

Given the paucity of existing methodologies related to measuring the longer-term impacts of attacks on healthcare, we re-oriented our approach to examine methodologies applied to assess the wider and longer-term impacts of complex interventions in humanitarian settings. We identified phenomena similar to attacks on healthcare, such as the impact of disasters, epidemics (e.g., the Ebola epidemic) or landmines and unexploded remnants of war. We read and summarised these papers qualitatively. While we did not find any particular methodology that could fully measure the longer-term impacts of attacks on healthcare, this process helped to identify key epistemological questions. We paid particular attention to the attribution question: how can we demonstrate that the observed impacts are the results of attacks on healthcare, and not the consequences of the broader conflict?

From this iterative literature review process, we initiated this working document including important conceptual frameworks and different potential methodologies. As the research team commenced specific country-based case studies, we have continued to amend the conceptual framework and range of potential methodologies. This document is also informed by two panel discussions with expert researchers and practitioners working in the humanitarian or health sectors. Two consultation meetings (October 2019 in Geneva and December 2019 in Washington, D.C., each two days) allowed the opportunity for the researchers to learn from other academics, policy experts, humanitarian practitioners and

other stakeholders with diverse and rich experience. The panel discussions (available on the RIAH website) focused on the conceptualization of impact, provided ideas on research methods, and advised on how to avoid pitfalls.

In order to contribute to the general state of knowledge and advance methodological discussions, we have documented our process and initial decisions and welcome comments from researchers and practitioners. Interested colleagues are welcome to send feedback to Audrey.Mahieu@unige.ch or Karl.Blanchet@unige.ch. In making explicit the conceptual issues and their methodological implications, we aim to advance rigorous and practical discussions about documenting attacks on healthcare and evaluating their impacts.

3. Conceptual issues related to defining 'attacks on healthcare'

Defining attacks on healthcare in conflict requires precision regarding three associated concepts: defining an 'attack', defining 'healthcare', and clarifying the 'context' in which attacks occur.

3.1 Initial frameworks on 'attacks on healthcare in conflict'

The first formal protections for healthcare services and personnel were enshrined in the first articles of the 1864 Geneva Convention and further detailed in the 1949 Conventions. These rules describe the objects to be protected but do not distinguish or describe what might be classified as an attack on healthcare. As an example, Article 18 of the Fourth Geneva Convention protecting civilians states:

> "Civilian hospitals organized to give care to the wounded and sick, the infirm and maternity cases, may in no circumstances be the object of attack, but shall at all times be respected and protected by the Parties to the conflict."(Geneva Convention (IV), 1949, art. 18)

Recent resolutions from the United Nations (UN) Security Council (2016) and the UN General Assembly (2014) have reiterated the vital importance of protecting health during conflict and the need for data to track attacks. The WHO, based on a mandate from the World Health Assembly in 2012, has employed its extensive humanitarian operations teams and local field partners to document attacks on healthcare in complex humanitarian emergencies. A recent operational definition from the World Health Organization's (SSA) programme characterises attacks on healthcare as:

> "Any act of verbal or physical violence or obstruction or threat of violence that interferes with the availability, access and delivery of curative and/or preventive health services during emergencies" (WHO, 2018, p.7).

The Safeguarding Healthcare in Conflict Coalition (SHCC) is a coalition of more than two dozen organisations active in research, advocacy and accountability on attacks on healthcare. Together they have published annual reports on the scope and range of attacks on health across the globe since 2015. In its most recent report in collaboration with the Swiss organisation Insecurity Insight, the SHCC notes that it uses the WHO definition and focuses its own documentation in the specific context of conflict (rather than the broader term of emergencies, used by the WHO):

> "The report follows the WHO's definition of an attack on health care: … [but] focuses on incidents of violence against health care in the context of conflict or in situations of severe political volatility and public health programs, including emergency responses" (SHCC, 2020, p.22).

3.1.1 Terminology: Attacks vs. Violence

The RIAH project utilises the term 'attack' to underscore the clear legal protections in situations of armed conflict, enshrined in the Geneva Conventions. Notably though, in referring to 'violence', the SHCC and WHO both avoid the term 'attack' in their formal definitions. Instead, they use the terminology of "incident" or "incident of violence" because "the word "attack" is often interpreted to convey intent, whereas many incidents reported are indiscriminate or reckless" (SHCC Methodology). The terminology of 'incidents' can also include interferences, such as administrative impediments, denial of access, protests or demonstrations that infringe on provision of healthcare. While 'attacks' may not be the ideal term, 'violence' has its own issues. As some experts in our panel discussions noted, the term 'violence' can imply physical violence and exclude threats, interferences, and non-physical trauma (Impact Panels Meeting Summary). While the formal definitions for both WHO and SHCC utilise the term 'violence', attacks and violence are frequently used interchangeably in the body of their reports, as well as by researchers, advocates and policy makers and in much of the research literature or other documentation on this topic. This working paper uses the term 'attack' as a comprehensive term, and not as one that implies only violent means or that conveys intent.

3.1.2 Obligations of parties to a conflict

The obligations to distinguish military from civilian objects, to engage in proportionate attacks, and to take precautions in military attacks are critical, and violations can be war crimes regardless of whether attacks specifically targeted healthcare or not. The intent of the perpetrator in striking a health facility is difficult to ascertain and not critically relevant to exposing a violation nor acknowledging an impact on health. Rather, the key issue is whether the violence against a health facility is a product of failure to comply with these rules on proportionality, distinction, and general protection of civilian lives, even if no specific intent to harm healthcare exists. In considering impacts of attacks on healthcare, there is an analogy in criminal law: It is common for the law to infer intent from the natural consequences of an act, e.g. stabbing someone in a fight might not be with intent to kill, but because the natural consequence can be death, a murder charge (which requires intent) can be brought. Similarly, perpetrators do not necessarily need to have their intent exposed to establish that a war crime has occurred.

3.1.3 Indiscriminate attacks vs. attacks on health sector

More practically, incidents classified as attacks (or violence) against healthcare are subtly different between the WHO and SHCC definitions and operations. WHO define the attack on healthcare by the impact on health. Technically the definition does not discriminate between an attack specifically on the health sector and an attack that may be on another sector (roads, markets, etc.) that can affect access to or the availability of health services

(WHO, 2018, annex 1). The SHCC definition, on the other hand, focuses specifically on incidents against the health sector. In the definitions presented in the 2020 report, SHCC authors note that "some forms of violence, such as psychological violence, blockages of access, or threats of violence, are rarely reported" and discrete monitoring of attacks on healthcare primarily includes attacks directly on the health sector domains (facilities, personnel, transports and, with difficulty, patients). Practically, while attacks on healthcare usually refer specifically to the health domains (facilities, personnel, patients, transport), it is clear that other types of civilian violence and conflict violence can dramatically impact health services. In the RIAH project, we acknowledge the importance of understanding the impacts of conflict on healthcare services and personnel, and also the difficulties of clearly and consistently distinguishing between attacks specifically *on* healthcare and attacks that *affect* healthcare. In our case studies, we aim to disentangle the effects of the conflict itself on healthcare and focus on understanding the impacts of attacks *on* healthcare specifically.

3.1.4 An impact-minded approach

Regardless of whether an attack was intentional, and whether an attack directly struck something or someone specifically in the health sector, there are both legal violations and impacts on health services to consider. Attacks on civilians without distinction of protected services, and without consideration of civilian harm, are violations of both IHL and human rights. Table 1 below displays examples of attacks deliberately targeting or unintentionally impacting healthcare and civilian infrastructure, all of which can have an impact on the health system. Even though intention and corresponding motive, as suggested by the context of the attack, is different, these incidents could all have devastating impacts on healthcare.

Table 1: Illustrative examples of attacks deliberately targeting or unintentionally impacting healthcare and civilians, all of which can impact the health system.

	Attacks *deliberately* targeting healthcare	Attacks on civilians *without distinction*
Attack that *directly struck* health sector	➔ An armed group deliberately targets a healthcare facility, injuring nurses and patients and stealing medical supplies. ➔ Stealing of solar panel from a health facility with the intent of disrupting access to vaccination for surrounding community.	➔ A rebel group attacks a village that houses a prominent military base. In the course of their attack, they damage a nearby civilian healthcare facility and nurses and patients are injured. ➔ Stealing of solar panels from a health facility with intent of using for power.
Attach that *did not strike* the health sector	➔ Landmines placed on a road to block access to health facility can restrict access to health services.	➔ Attack on a market that provides food to hospital staff. ➔ Attack on a residential building where a nurse's family lives may result in significant impacts on the nurse's life, both personal and professional.

One approach is to document both attacks that deliberately target or unintentionally impact healthcare, but limiting it to those for which health facilities, healthcare workers, patients and medical transports were clearly identifiable (e.g. healthcare worker wearing a visible medical emblem even when outside of the health facility premises). This approach has some limitations in contexts such as in Syria, where ambulances are camouflaged, health workers try to stay under the radar, and health facilities are built underground to protect against deliberate targeting. A second approach would be to document and measure the impact of all civilian attacks, irrespective of whether or not they deliberately target healthcare, whether or not healthcare workers were identifiable and on duty, but specify the details in the narrative and analysis. The RIAH project studies the impacts of attacks on healthcare and the characteristics, perpetrators, and results of these attacks are highly context specific. Each case study may focus on different parts of this framework, with different visibility of the health system, with the aim of illuminating the complex interactions among these issues.

3.2 What constitutes an 'attack'?

Operationally, both the SHCC and the WHO are in general agreement that incidents can include both physical violence and non-physical attacks. The SHCC report describes a set of incidents they would classify as attacks (italics added and represent those attacks which may not be physically violent):

> "Bombings, explosions, looting, robberies, hijackings, shootings, gunfire, *the forced closure of facilities*, the violent searching of facilities, fire, arson, *military use, military takeover*, chemical attack, *cyberattack*, abduction of health workers, *denial or delay of health services*, assault, *forcing staff to act against their ethics*, execution, torture, violent demonstrations, *administrative harassment*, *obstruction*, sexual violence, *psychological violence, and the threat of violence*" (SHCC 2020, p.22)

While some of these incidents affect personnel or patients, others affect a facility or transport. Table 2 below categorises incidents that either the SHCC, WHO or others have used as affecting persons or objects.

Table 2: Examples of types of violence on persons and objects

On persons (personnel, patients)	Violence includes killing, injuring, kidnapping, harassing, threatening, robbing and intimidating personnel, patients or those trying to access healthcare. Blocking or interfering with timely access to care; the deliberate failure to provide or denial of assistance; discrimination in access to, and quality of, care; and interruption of medical care.
On objects (facilities, transports, equipment)	Violence includes bombing, shelling, looting, forced entry, shooting into, encircling or other forceful interference with the running of healthcare facilities and transports and other equipment (such as depriving them of electricity and water). Violence includes attacks upon, theft of and interference with medical vehicles.

The ICRC explicitly includes an additional type of attack on healthcare, referring to the misuse of health facilities or protective emblems. This covers incidents involving the improper use of the Red Cross or Red Crescent emblems and other signs designating medical facilities, transport or personnel (Terry, 2013). These incidents can be attacks on either objects or personnel. The nature of attacks is complex and it is well understood that attacks on objects will invariably affect persons, and attacks on persons will frequently affect health services and facilities.

There is also an issue of consistent terminology. In many cases, organisations that document attacks on healthcare use similar or the same terminologies, but may do so with different meanings in mind. For example, kidnapping and abduction are often used as

synonyms. Both involve the deprivation of someone's liberty, however experts often distinguish the two based on motive and the means involved (kidnappings have a motive, involve enticement, and imply forced and unlawful confinement against someone's will; abductions may not have a motive, and involve force, deceit or coercion that results in confinement against their will).

To allow comparison between studies, researchers and those documenting attacks on healthcare should build on existing definitions and categories, wherever possible, in order to provide clarity in a codebook about terminologies, meanings, as well as inclusion and exclusion criteria.

3.3 What constitutes 'healthcare'?

The operational definition of 'healthcare' tends to be consistent across different organisations, with general consensus on four domains that constitute 'healthcare':

1. Healthcare workers
2. Patients (the 'wounded and the sick')
3. Healthcare facilities
4. Medical transport

However, the inclusion criteria of these four dimensions vary across sources. For instance, among the initiatives to document attacks on healthcare that we reviewed, differences exist in the inclusion and exclusion criteria for the four domains. We use three sources below (ICRC, WHO, and SHCC) to illustrate these differences.

3.3.1 Who are healthcare workers?

Healthcare personnel and healthcare workers universally include professional medical personnel such as doctors and nurses (see table below). While the ICRC and WHO definitions explicitly include auxiliary and administrative staff, there is ambiguity about the inclusion of support roles, in particular those who do not support direct clinical care (security guards, secretaries, people in the billing department, etc.). In the context of conflict, determining the role of health workers who have been attacked is fraught with practical and ethical tensions, particularly in distinguishing those who are not involved in clinical care from those who are. As a result, many research papers classify all staff from a facility or clinic as health workers.

Table 3. Definitions of healthcare workers following different sources

Health Care in Danger (ICRC)	Health-care personnel include doctors, nurses, paramedical staff including first-aiders, and support staff assigned to medical functions; the administrative staff of health-care facilities; and ambulance personnel (ICRC, 2011, p.14).
WHO	Any person contributing to the delivery of curative or preventive health care, with or without medical or paramedical training (i.e. both health care providers, those who provide health care directly to patients, and auxiliary staff, those who support these services) (WHO, 2018, p.29).
SHCC	Any person working in a professional or voluntary capacity in the provision of health services or who provides direct support to patients, including administrators, ambulance personnel, community health workers, dentists, doctors, government health officials, hospital staff, medical education staff, nurses, midwives, paramedics, physiotherapists, surgeons, vaccination workers, volunteers, or any other health personnel not named here (SHCC, 2020, p.23).

3.3.2 Who are the wounded and the sick?

Patients, referred to in IHL as 'the wounded and sick', can refer to both those currently in the care of medical personnel or those seeking care who may require treatment, as well as those who are wounded but may not require professional medical care. However, there are innumerable scenarios that would have to be considered individually. For instance, pregnant women fall under the care of medical personnel and, while not wounded or sick, would be considered patients in most contexts. Similarly, the definitions do not include patients' visitors and accompanying persons but in practice if a visitor or an accompanying person is injured in an attack, they may be classified as a patient.

Table 4: Definitions of patients following different sources

Health Care in Danger (ICRC)	The wounded and the sick include all persons whether military or civilian who are in need of medical assistance and who refrain from any act of hostility. This includes maternity cases, new-born babies and the infirm (ICRC, 2011, p.10).
WHO	Any person seeking or in need of health care (WHO, 2018, p.29).
SHCC	No definition – not included in annual SHCC reports because of a lack of consistently available data.

3.3.3 What are healthcare facilities?

Facilities is a broad term that most actors utilise to include a range of facilities that house medical services, including clinical spaces (such as hospitals, clinics, doctor's offices, transfusion centres, laboratories) and non-clinical spaces (such as pharmaceutical stores or factories, medical or nursing schools and medical warehouses). There is no distinction between public or private ownership. Facilities managed by the militaries of parties to the conflict have explicit legal protection. Under IHL rules, facilities should be clearly marked

with a medical emblem but protections still stand regardless of whether an emblem is displayed.

Table 5: Definitions of healthcare facilities following different sources.

Health Care in Danger (ICRC)	Health care facilities include hospitals, laboratories, clinics, first-aid posts, blood transfusion centres, and the medical and pharmaceutical stores of these facilities (ICRC, 2011, p.8).
WHO	Any facility, fixed, mobile or temporary, providing curative or preventive health care. This includes hospitals, laboratories, clinics, first-aid posts, blood transfusion centers, health information centers, community health centers, vaccination posts, and the medical and pharmaceutical stores of those facilities (WHO, 2018, p.29).
SHCC	Any facility that provides direct support to patients, including clinics, hospitals, laboratories, makeshift hospitals, medical education facilities, mobile clinics, pharmacies, warehouses, or any other health facility not named here (SHCC, 2020, p.23).

3.3.4 What does medical transport constitute?

Medical transport includes a variety of transport vehicles, from motorcycle medical supply, ambulances to vaccine convoys. There is a distinction between the SHCC definition of transport, which is restricted to those used to transport persons, and that of the ICRC and WHO, which include non-clinical transports of medical supplies. None of the current definitions (see table below) explicitly include newer modalities such as drone transport of medication and supplies but these would likely fall under the broad definitions.

Table 6: Definition of transport following different sources

Health Care in Danger (ICRC)	Medical vehicles include ambulances, medical ships or aircraft, whether civilian or military; and vehicles transporting medical supplies or equipment (ICRC, 2011, p.18).
WHO	Any individual or collective means of transport, which function is to convey the wounded and sick, or to transport drugs, medical material, or health care personnel. This includes ambulances, motorcycles, buses, boats, planes and other transports chartered for medical use (WHO, 2018, p.29).
SHCC	Any vehicle used to transport any injured or ill person, or woman in labor, to a health facility to receive medical care (SHCC, 2020, p.23).

In an attempt to harmonise the way of defining 'healthcare' in the context of the RIAH research project, we suggest aggregating the above definitions to develop a comprehensive definition for each of the domains (Table 7). In most instances, we use the broadest inclusion criteria for each domain.

Table 7: Possible comprehensive definition for the four domains of 'healthcare' based on ICRC, SHCC and WHO definitions.

Health facilities	Any facility, clinical or non-clinical, fixed, temporary and mobile, providing curative or preventive healthcare services, and their medical storage units. *Including (but not limited to): hospitals, makeshift hospitals, laboratories, clinics, medical education facilities, first-aid posts, vaccination centres, blood transfusion centres, warehouses, and the medical or pharmaceutical stores of these facilities.*
Healthcare workers	All persons working in the provision of healthcare, with and without formal training, as well as auxiliary and support staff employed by or volunteering for health facilities and organisations. *Including (but not limited to): administrators, community health workers, dentists, doctors, nurses, midwives, physiotherapists, technicians, vaccination workers, first responders and their administrative and logical support persons.*
Patients (the wounded and sick)	All persons, military or civilian, seeking or in need of medical assistance or wounded or sick, and who refrain from any hostile or conflict-related act. *Including (but not limited to): the wounded and sick, pregnant women and in labour and their babies, and those requiring nursing services for age or infirmity, healthy people seeking vaccinations or other preventative care.*
Medical transports	Any individual or collective means of transport, whether civilian or military, private or commercial, for which the function is to convey the wounded and sick, or women in labour, or to transport drugs, medical material, or health care personnel. *Including (but not limited to): ambulances, motorcycles, buses, taxis, private vehicles, boats, planes and other private or commercial transports chartered for medical use.*

3.4 Defining the context of the attack

The context of an attack – and therefore its inclusion in data collection initiatives – is another element on which definitions of attacks on healthcare differ. For the purposes of IHL and most of the research and reports on attacks on healthcare, that context is "conflict", and refers to armed conflict or war.

However, differences exist among those researching conflict in making a determination of a 'conflict state'. Organisations tracking conflict use varied definitions, based on the number of fatalities, or the nature of the fighting. The distinction between armed conflict

and states/countries experiencing civil unrest and political volatility is challenging, as there are no consensus distinctions between the two. Strictly speaking, determining the end of a conflict is imprecise, because more often than not it is violence that ends and not the conflict per se. Some conflicts become protracted, and some displaced persons and refugees remain in camps or without permanent settlement for decades. In other states, a formal end to a conflict is replaced by high levels of continuing violence and instability, sometimes including renewal of war.

Moreover, armed conflict may be defined using legal or research criteria. In legal terms, the context of the attack matters for the applicability of specific legal frameworks. Attacks that occur in settings of armed conflicts, whether international or non-international in nature, are subject to International Humanitarian Law (IHL), whereas attacks that occur in non-armed conflict settings will be subject to human rights legal frameworks, national law or international criminal law (including the Rome Statute of the ICC). All of these have explicit protections for healthcare services. It is well established that both state and non-state armed groups are bound by IHL (Bellal, 2018). Yet more precisely, IHL applies only in situations where the parties to an international or non-international conflict are 'organised', according to particular criteria. While human rights treaties formally bind only state signatories, the extent to which non-state armed groups are bound by these same human rights obligations is less clear.

The definition of conflict for research, advocacy or operational purposes, however, does not necessarily overlap with the legal definitions. For example, the inclusion of violent states in which well-armed gangs (i.e. in Central America and Mexico) or organised criminal groups operate may be highly relevant for practitioners. Of note, even the ICRC, the guardians of IHL, currently include 'other situations of violence' in their "Healthcare in Danger" programme (ICRC, 2020). The Uppsala Conflict Data Program (UCDP), a commonly used, academic source of annual data about armed conflict, uses the threshold of 25 battle deaths in a given year to determine the existence of an armed conflict.[1] Thus, an armed conflict may exist but if fewer than 25 individuals die in battle, the conflict would not appear in the annual UCDP dataset. In sum, reports using the legal definition of armed conflict could feature a different set of countries than reports using the UCDP definition. Neither definition would necessarily incorporate situations of political instability, gang violence, or generalised violence that significantly affects healthcare, situations that other stakeholders may include in their documentation.

A first step is to decide which framework to apply to the study. Depending on the aims, objectives and focus, a legal framework (IHL, human rights, criminal law), a public health

[1] https://www.pcr.uu.se/research/ucdp/. Like legal definitions, the UCDP definition does require an 'incompatibility' between two organised groups in order to meet the definition. Thus, as with IHL, it is possible to have more than one armed conflict within a given state territory.

framework (how are the health system and population being impacted), or other frameworks (prioritising specific types of actors, regions, types of violence or domains attacked) may apply. In the RIAH project, we aim to utilise broader inclusion criteria for conflict, including conflict between state and non-state armed groups, as well as state violence towards civilians, and settings of political volatility and unrest where organised groups, named or unnamed, may perpetrate violence against healthcare. We exclude peaceful states in the first place, and within conflict settings, we exclude instances clearly documented as interpersonal violence unrelated to political activity or motivations.

Practical Notes:
The SHCC report explicitly stipulates that attacks on healthcare take place in situations of conflict, including political instability. In addition, SHCC only reports incidents of violence against healthcare if they are perpetrated by a conflict actor (based on UCDP definitions). It excludes actions of interference in the provision of healthcare such as strikes, protests and attacks on healthcare carried out by non-conflict actors (individuals and groups) such as criminals, patients, other civilians and health workers themselves (SHCC, 2020, p.22). The WHO definition of 'attacks on healthcare', however, focuses on attacks in emergency contexts that may include disasters resulting from natural hazards (e.g., earthquakes or floods). In reality, the activities of armed groups can be ambiguous in some settings and distinguishing or defining conflict and non-conflict actors may be difficult. Amidst the 2020 COVID-19 pandemic, for instance, as well as other infectious disease outbreaks (e.g., Ebola), identifying perpetrators and classifying their role as either interpersonal or conflict-related has been challenging.

In assessing which countries report on attacks on healthcare, we find that the list has more to do with practical realities rather than a comprehensive assessment of conflict status. The WHO SSA reported attacks on healthcare on 14 countries in 2020, likely based on priority countries of the WHO Health Emergencies Programme. The 2020 SHCC compendium reports on attacks on healthcare in 20 countries but acknowledges that many countries where these attacks occur are simply not counted because of lack of available data. In some of these countries or regions, local actors conduct independent work regarding attacks on healthcare while in many others, there is no systematic data collection with which to aggregate data.

Table 8: Comparison of countries included in the WHO SSA and SHCC (Note that the SHCC report includes SSA data)

WHO SSA (as of September 2020)	2020 SHCC Report (published June 2020)
Afghanistan	Afghanistan
Burkina Faso	Burkina Faso
Central African Republic	Central African Republic
Democratic Republic of Congo	Democratic Republic of Congo
Libya	Libya
Mali	Mali
Myanmar	Myanmar
Nigeria	Nigeria
Palestine	Palestine
Somalia	Somalia
South Sudan	South-Sudan
Syria	Syria
Ukraine	Ukraine
Yemen	Yemen
	Cameroon
	Egypt
	Ethiopia
	Iraq
	Pakistan
	Sudan

As the discussion above implies, what may appear as minor differences in terminology can result in discrepancies in overall numbers and differing inclusion criteria. Beyond these conceptual discussions, the decision to document attacks in a specific country can come down to questions of logistics, presence, feasibility and ease. It is perfectly acceptable that various stakeholders utilise myriad definitions that fit best with their study aims and objectives. However, explicit definitions for and consistent use of terms are critical to clarity and the ability to aggregate data and compare datasets.

3.5 Categorising attacks

Creating consistent definitions and categories of attacks is important to establishing the unit of analysis for studying the impact of an attack. To study impacts, it can be useful to understand what and how each category could result in different impacts. For instance, the various methods by which health personnel are deprived of their liberty (arrested, detained, kidnapped) will lead to their inability to serve patients. Whether a facility is burned, bombed or occupied, the facility may not be available to provide health services. As such, it may be useful to categorise attacks in terms of the attack **action** (e.g., *ambush*

of members of a vaccination campaign, *bombing* of a hospital, *looting* of facilities, *abduction* of health workers, *denial* of health services), or by the **result** of the action (e.g., hospital closure, health personnel not available, patients not vaccinated). Categorising attacks by result may become complex as a single attack may have multiple different types of results (i.e. torture of physician may result in both limited human resources for health when the physician is not available to work, and psychological and physical sequelae for the health worker herself). Table 9 illustrates several typologies of attacks on healthcare, which could be expanded to cover the four domains of attacks as well as the health system and misuse of emblems. These approaches are in their early phase and will require more discussion.

Table 9: Examples of typology of common attacks, based upon action and result

Description	Possible categorisation based on action	Possible categorisation based on result
Attack on a hospital	Bombing, chemical attack	Facility unavailable Patients and personnel injured
Assault on healthcare personnel	Assault (could be physical or sexual in nature) Torture, intimidation, assault, forcing medical personnel to act against their ethics	Limited human resources for health
Theft of medical supplies	Theft Also robbery, looting Destruction of supplies	Loss of medical equipment or removal of assets
Use of a facility for military purposes	Occupation of a facility Storage of weapons	Facility unavailable
Denial of access to health facility	Deny patients access to healthcare	Facility unavailable Poor health outcomes for patients seeking care
Obstruction of healthcare	Tolls for passage to access hospital Barricades on road to prevent access to hospital Forced closure of facilities	Facility unavailable

When creating a typology of attacks, it is important to understand the complex overlaps among categories, how attacks on healthcare frequently affect several parts of the health sector at once, and can have multiple divergent downstream sequelae.

In classifying an attack, do you do so based on mutually exclusive categories? In the case of a rebel group targeting a healthcare facility that also resulted in injury to nurses and patients and the theft of supplies, multiple types of attacks apply. Do you classify the attack

as theft or assault or both? Choosing both more comprehensively captures the nature of the event, but creates the possibility of double counting of events. In practice, documenting and describing attacks on healthcare frequently requires choosing a primarily affected domain.

However, most, if not all, attacks are interconnected and an attack on one domain directly affects the others. In our experience designing a documentation system for attacks on healthcare in Syria, we found that patients are deeply affected, sometimes killed, by an attack on a facility or ambulance. It becomes arbitrary to decide whether these acts are primarily attacks on patients, personnel or facilities. And this requires a determination of impact, which may not be possible without further investigation, and has implications for how the study models impact. When a hospital is bombed, it is not hard to understand it as an attack on patients. But these acts tend to be counted as attacks on a facility that result in patient morbidity. Gauging the most consequential aspect of the attack is delicate, since it requires comparing consequences of different natures (e.g., the consequences of kidnapping medical staff compared with the partial destruction of a health facility). All of these approaches invite trade-offs and require clarity in documenting approaches to classification.

While there is no one right protocol, attempting to enumerate types of attacks may inadvertently deprioritise some domains over others. Of all the possible domains for which data exist about attacks on healthcare, attacks on patients are the least well documented. Understanding all attacks within a "health system" perspective could both simplify the classification and increase understanding of the true nature of the interrelated impacts of even the most localised attacks.

4. Conceptualizing Impact

Impact and impact evaluation has been defined in the literature as follows:

> "An **impact** is a positive or negative, direct or indirect, intended or unintended change produced by an intervention. An **impact evaluation** is a systematic and empirical investigation of the effects of an intervention; it assesses to what extent the outcomes experienced by affected individuals were caused by the intervention in question, and what can be attributed to other factors such as other interventions, socioeconomic trends, and political or environmental conditions" (Clarke et al, 2019, p.1)

In relation to documenting and measuring the impact of attacks on healthcare, considerations of the scope of the impacts, whether they are direct or indirect, their time frame (short-term to long-term), and how to disentangle the impact of the conflict itself from the specific impact of attacks on healthcare are all required.

Numerous terms are used to describe impacts. We define a few of these for purposes of the project and this chapter:

- ❑ Wider impacts: impacts on fields other than the health sector.
- ❑ Longer-term impacts: impacts chronologically manifesting themselves later, or impacts sustaining over time.
- ❑ Indirect impacts: impacts caused by complex or not directly apparent causal pathways.

4.1 What is currently known?

Research studies on the impact of attacks on healthcare are limited thus far. The few existing studies have been primarily qualitative and focused on documenting the impact of attacks on healthcare on the health workers and through them, the health system. Footer, Rubenstein and colleagues (2014; 2018) explored the impact of attacks on healthcare in Myanmar and Syria. In these studies, health workers reported how the destruction of health facilities, causing the loss of essential medical supplies and equipment, severely reduced the availability of medical services. Referrals to other functional facilities could take days, delaying the provision of life-saving treatment, and compromising patient's survival. In Syria, interviews with health workers found that the targeting of hospitals and ambulances dramatically decreased the availability of healthcare, and pushed health providers to adopt protection strategies, such as placing hospitals underground. Systematic targeting of health facilities had devastating impacts on health seeking behaviour and resulted in people avoiding health facilities. Interviewees reported that the

quality of care was severely impacted with makeshift hospitals replacing destroyed health facilities, and healthcare providers performing tasks beyond their qualifications to meet the chronic shortages of surgeons and anaesthesiologists. Health providers observed a resurgence of preventable diseases like measles and polio. Acute mental health stressors and demoralising working conditions were impacting health workers' well-being in the long-term (Footer et al., 2018). Similarly, Rubenstein and colleagues (2015) highlighted the psychological trauma of arrest, detention, torture, and threats against healthcare professionals in Syria, matched by the everyday circumstances of struggling to meet the needs of a population under attack.

Fardousi and colleagues (2019) studied adaptive approaches implemented by administrators and frontline workers of targeted health facilities in Syria, including working underground in areas less likely to be attacked by chemical bombs, fortifying key facility areas with sandbags, reducing the visibility of the facility, and dispersing the different units and departments of the facilities in different parts of the city. Afzal and Jafar (2019) conducted a scoping review of the wider and long-term impacts of attacks on healthcare. The found that impacts of attacks on healthcare included the suspension, closure and relocation of health facilities; the loss of healthcare workers either due to death, injuries or fleeing the country; the lack of essential medical supplies; the reduced functioning capacity of facilities; the changes in practices operated by healthcare workers; the reduced capacity to manage chronic diseases; the resurgence of vaccine-preventable diseases; the change in health seeking behaviour; health workers' mental health deterioration; and the disruption of medical education.

These initial studies focus primarily on qualitative interviews with health workers and develop a rich trove of hypotheses on health system impacts. The RIAH project aims to build on these initial studies to develop a more robust and rigorous framework for understanding impact.

4.2 Defining the scope of the impact to study

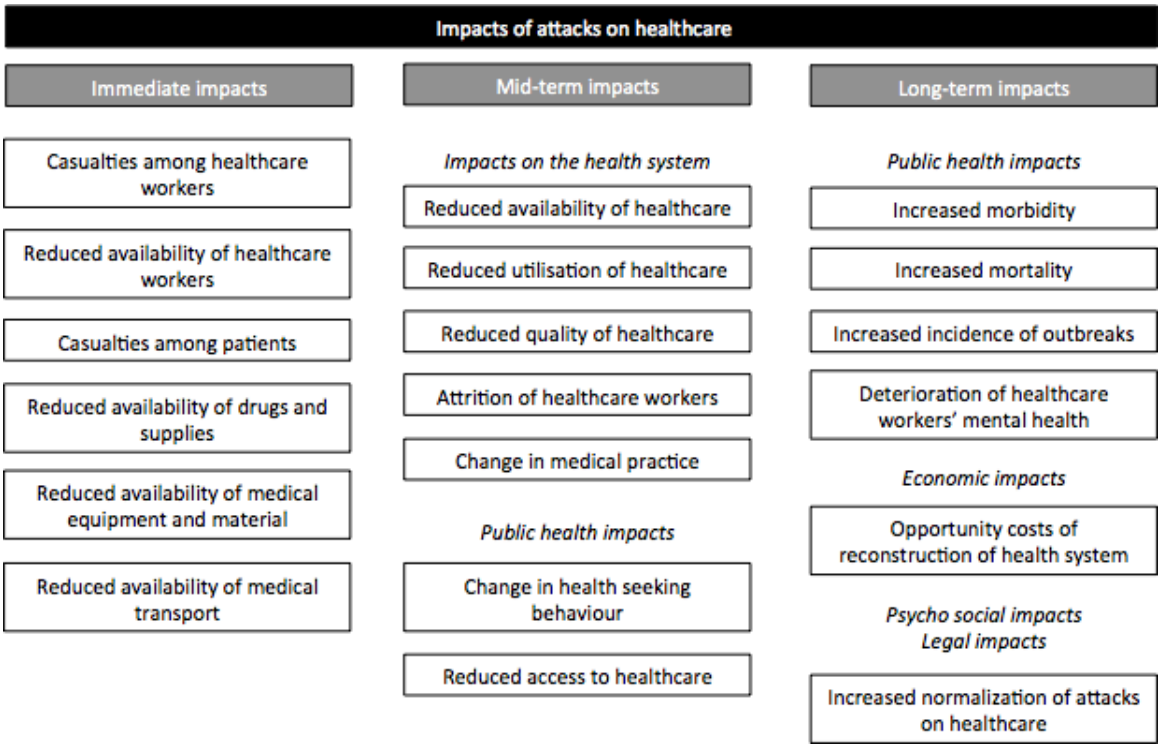
The impact of attacks on healthcare can extend beyond the health sector. Social impacts on the community, behavioural and psychological impacts, economic impacts, and impacts on medical ethics and the law are all possible spheres of study. For instance, the death of healthcare workers can have a devastating impact on the revenue of their family. An increase in the population morbidity and mortality can have an economic impact on the society as workforce is reduced. Systematic attacks on healthcare can affect ethics as violence on healthcare is normalised. The RIAH project does not focus solely on the impacts on the health system, but aims to study these wider impacts as well.

However, because of constraints on time and resources, one study cannot cover all impacts. A first question is: **what is our research area of interest?** Experts in our workshops identified the following possible types of impact:

- Public health outcomes: change in health outcomes, change in diseases
- Humanitarian operations: security protocols, programme design and implementation
- Clinical care: practice of medicine, triage decisions, rationing
- Social and behavioural impacts: norms change, behaviour of conflict parties
- Economic impacts: jobs, livelihoods, health resources
- Legal impacts: IHL, ICC, anti-terror laws, IHRL
- Impacts on medical ethics
- Impacts on diplomacy and international relations

While one or more lenses might be relevant, an explicit framework for how attacks on healthcare relate to those impacts in a particular study is useful for each area selected. Figure 1 below presents an example of a framework of the impact of a series of attacks on health facilities. The initial attack can have several immediate sequelae which then have mid-term and long-term impacts on several spheres of interest.

Figure 1: Example of possible impacts of attacks on health facilities.



A second question is: **what level of impacts do we want to study?** Do we want to study general impact at the level of:

- individuals (e.g., patients, medical workers and their families, as well as their co-workers)
- organisations/institutions (e.g., facility level, organisation providing care, ministry of health)
- specific communities (e.g., those living in the immediate vicinity of a facility)
- population of a country

Within the health sector, the level of impacts can include:

- health service delivery
- health workforce
- specific health programmes (e.g., the provision of care for sexual and gender-based violence, vaccination programmes)
- health provider (e.g., a particular hospital, a medical NGO)
- health system of a country

A third question is: **what will be the geographical scope of the study?** Do we want to study impact at the level of:

- Catchment areas (health facility catchment area, referring to the geographic area served by a particular health facility)
- Districts, provinces, regions, country

Do we want to explore potential spill over effects on other geographical areas? For example, when a health facility closes, do we want to study the effects on the neighbouring health facilities? The answer will depend on the information available to study and on the hypotheses to be tested.

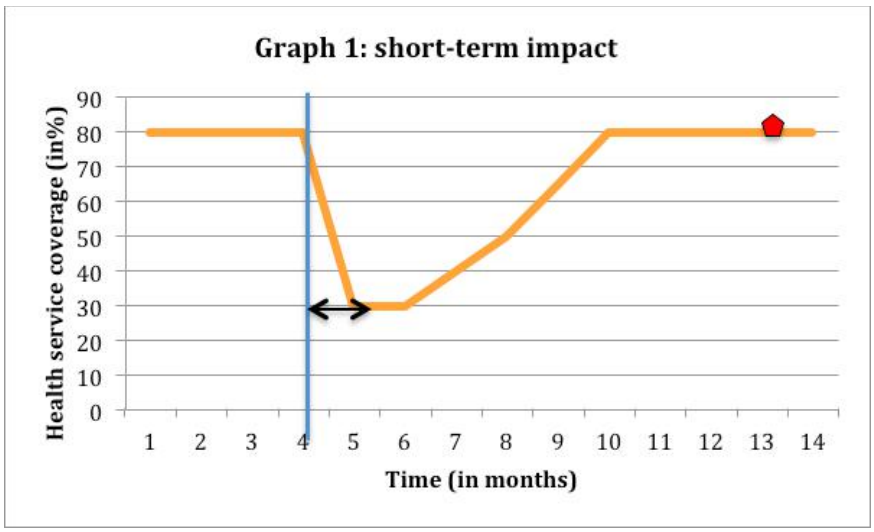
4.3 What characterises longer-term impacts?

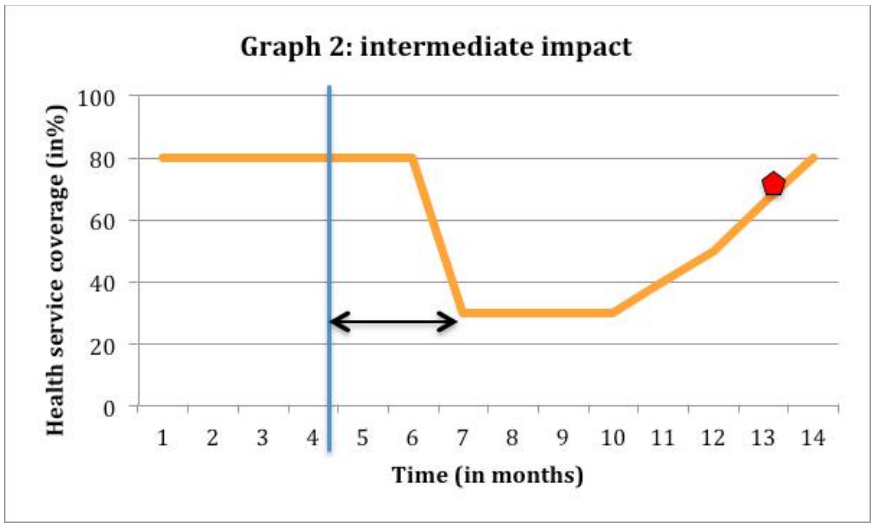
From a health perspective, long-term impact is usually a synonym for a long-lasting effect. It conveys the idea that effects produced by a phenomenon are sustained over time.

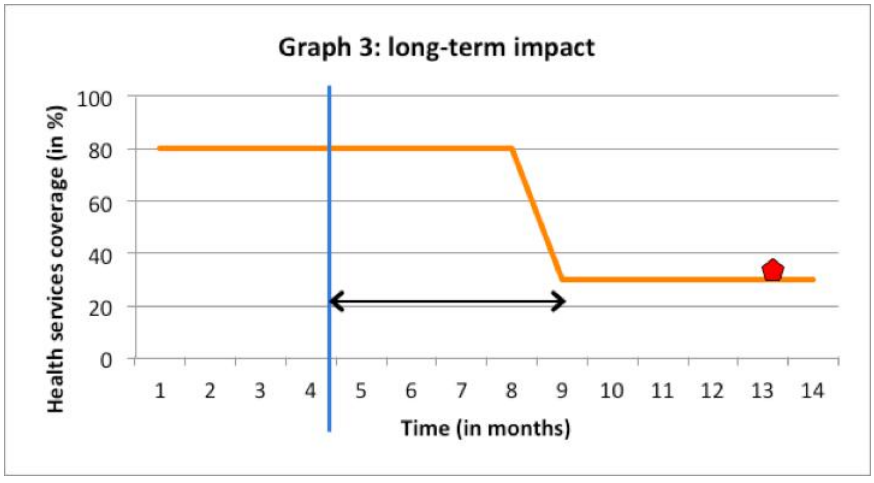
For development practitioners, long-term impacts usually refer to effects with a long time lag between the implementation of an intervention (in our case, an attack) and the manifestation of the effects. This is in contrast to short-term impacts, which manifest themselves rapidly after the implementation of an intervention (attack). Accordingly, intermediate impacts manifest themselves later than short-term impacts but sooner than long-term impacts (Hearn and Buffardi, 2016).

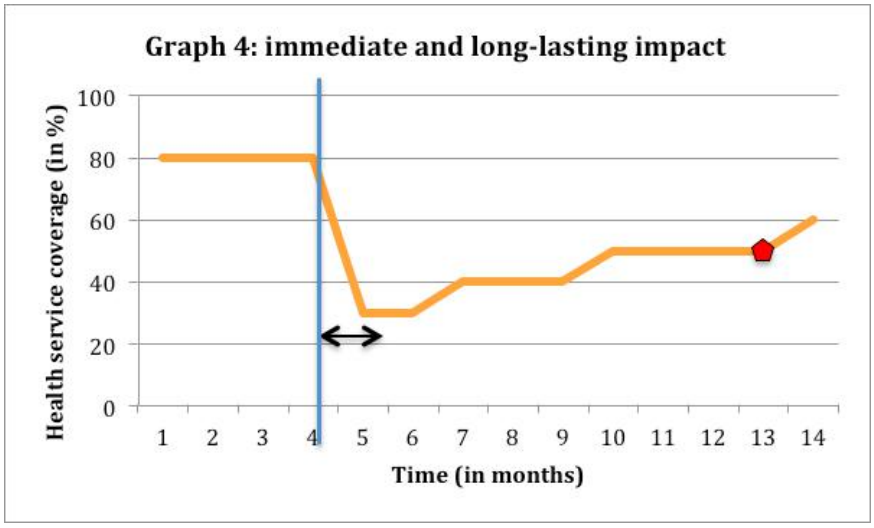
The four graphs below illustrate the notions of sustainability over time and time lag between attacks on healthcare and the manifestation of impact in terms of health services coverage. The blue line indicates the time when attacks on healthcare occurred. The

orange line is the trend in health services coverage. The red pentagon is the health services coverage at month 13.









For the sake of illustration, we assume that the decrease in health services coverage is caused entirely by the attacks on healthcare. In graph 1, the lag between the occurrence of the attacks on healthcare and the decrease in health services coverage is short (one month). We observe that the attacks on healthcare had an immediate impact on health services coverage. In graph 2, the lag is longer (10 weeks). In graph 3, the lag is much longer (almost 5 months).

In graph 1, at month 13, health services delivery has recovered from the attacks on healthcare and its coverage is the same as before the attacks on healthcare occurred. In graph 2 health services delivery is still in the process of recovering at month 13 and its coverage is slightly below what it used to be before the attacks. In graph 3 health services delivery is still severely impacted by the attacks at month 13 and has not yet recovered.

Note that impacts with a rapid onset can be long lasting (Graph 4), and impacts that manifest themselves a long-time after the attacks occurred can be only brief. In Graph 4, the lag between the occurrence of the attacks on healthcare and the decrease in health services coverage is short (one month), but at month 13, health services delivery is still severely impacted and has not yet recovered.

This has some implications on the study design and methodologies that we select to measure the impact of attacks on healthcare, in particular:

1. The time lag between the occurrence of the attacks and the manifestation of the impacts.
2. How long the impacts are likely to sustain over time.

In the examples above, if we measure the impacts at month 7 (2 months after the attacks), we will only capture impacts with rapid onset. If we measure the impacts at month 13, we

will only capture long-lasting impacts, unless we look retrospectively at routine health services data each month.

We note that the longer the time lag between the occurrence of attacks on healthcare and the decrease in health services coverage, the less clear it is whether attacks are the cause of the decrease in health services coverage. We discuss this issue in section 5.

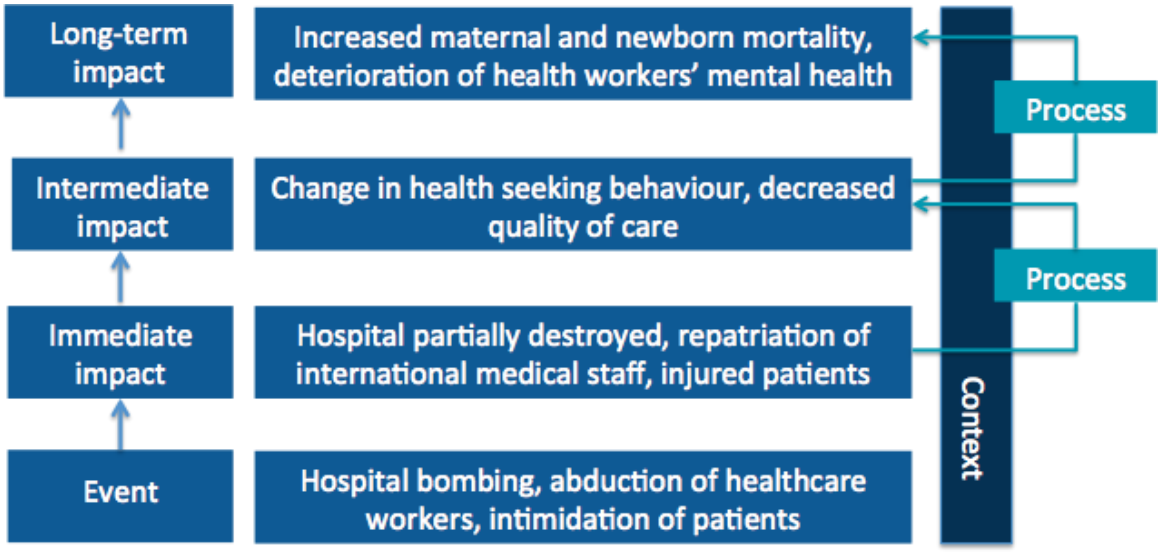
If one of the objectives of the study is to demonstrate how long the impacts of attacks on healthcare sustain, the study period should be very long. A study on long-term effects of chemical warfare agents on children in Kurdistan, for example, showed that more than 30 years after being exposed to chemical warfare agents, the exposed group was significantly more likely to have respiratory, dermatological, ophthalmic and neurological problems than the non-exposed group (Talabani JL et al. 2017).

As mentioned before, most studies that documented impacts of attacks on healthcare in a quantitative way focused on immediate impacts (e.g., number of deaths and injuries, number of days health services have been interrupted). In this working paper, we use the terminology 'longer-term impact' to emphasise the need of documenting and measuring impacts beyond the immediate.

4.4 Direct versus indirect impacts

Indirect impacts are effects that are produced by a phenomenon following a causal pathway that is not apparently direct. In the context of 'attacks on healthcare' this can be illustrated by the case of an assault against a vaccinator. The immediate effect of the attack is the suspension of vaccination outreach activities and the injury to the person. Following the suspension of the vaccination outreach activities, vaccination coverage decreases, which, later, has an effect on mortality rates. Both of these are impacts. Even though no patient (in this case an individual, most likely a child waiting to be vaccinated) was killed during the attack, the assault against the vaccinator indirectly contributed to increasing the mortality of children. The suspension of vaccination activities and the injury to the vaccinator are direct impacts of the assault. The decrease in vaccination coverage and the increase in childhood mortality are indirect effects of the assault.

Figure 2 below illustrates an example of chain of impacts resulting from attacks on healthcare:



In this example of chain of impacts, we note that the further we go along the impact chain, the more difficult it becomes to attribute the cause of the observed effects. This is because many exogenous factors can contribute to increased maternal and new-born mortality (such as a famine, drug or clinical staff availability), particularly as time passes, or cause deterioration in healthcare workers' mental health (such as the non-payment of salaries). We discuss this issue in section 5.

Note that the indirect nature of impacts is also mentioned in the literature as 'reverberating effects' in the domain of IHL (Zeitoun and Talhami, 2016; Robinson and Nohle, 2016; Wille, 2016; Wise, 2017).

For those researching the impact of attacks on healthcare, the following implications must be considered:

- Inclusion/exclusion: whether to limit the study to direct impacts, or to include indirect impacts.
- Causal pathways: If we want to capture the indirect impacts of attacks on healthcare, we need to capture direct impacts with rapid onset after the attacks, and identify the impacts deriving from these direct impacts, at different points of time, to be able to build the impacts pathway.
- Scope and timeframe: how far along the causal pathway we want to examine impacts. This brings the question of delimiting the scope of impacts in terms of time, geographical space and research area of interest.

These factors must all be considered in a conceptual framework, but the decisions on specific studies are dependent on the context, areas of interest and expertise, time, resources and funding.

5. Methodological considerations

5.1 Instance-based vs impact-based

When studying the impacts of attacks on healthcare, several approaches are possible. An instance-based study begins from the specific attack on healthcare and explores the impacts resulting from this attack, using a causal pathway. An impact-based study could focus on pre-identified consequences and retrospectively seek to explain the origin of the deteriorating health or health system conditions and retroactively map the linkage to the attack(s) (see 5.2 below).

The advantage of impact-based studies is that we can focus on the impact itself. However, in impact-based studies we may discover that the deteriorating health or health systems conditions are not attributable to a specific attack on healthcare. In contexts where little is known about impacts of attacks on healthcare, instance-based studies are likely to be more appropriate.

5.2 Retrospective versus prospective approach

In this working paper, we define a retrospective approach as any study that looks backwards at impacts that have already manifested themselves. Data are collected from surveillance studies, from medical or other records, economic assessments, or by asking participants to recall the attacks on healthcare and their impacts. By contrast, a prospective approach examines impacts that manifest themselves during the study period. The Table 10 below describes the advantages and disadvantages between the two approaches.

Table 10: Suitability of adopting retrospective or prospective approach to study the impact of attacks on healthcare.

	Retrospective approach	Prospective approach
Cheaper to carry out	+ + +	-
Shorter to carry out	+ + +	-
Can begin an assessment shortly after the attack, or look at short term impacts	-	+ + +
Can look at longer term impacts	+ + +	-
Requires available and reliable secondary data	+ + +	+

The key aspects to consider when choosing whether to adopt a retrospective or prospective approach are:

1. In the context of our study, when did attacks on healthcare begin?

If attacks on healthcare are a new phenomenon:

- A retrospective approach will be able to capture the immediate and mid-term impacts, but unlikely the long-term impacts.
- A prospective approach will be able to capture the immediate and mid-term impacts provided that the assessment begins shortly after the attack.
- A prospective approach would allow capturing long-term impacts as long as the duration of the study is long enough and methods are continually adjusted.

2. What is the availability and quality of secondary data?

- A retrospective approach will rely mostly on secondary data. If these data are not available and reliable, this will affect the study design that we can apply and therefore the quality and nature of the findings.
- Not all retrospective studies use secondary data. We could create data collection tools (e.g., survey questionnaire) and ask participants to describe attacks on healthcare and the impacts that they observed. Longer time periods between the data collection and the attack increase the likelihood of more significant recall bias, which is an issue in terms of data validity.
- A prospective approach will allow researchers to design tools to collect the primary data needed.

3. Do we want to document and measure the impact of each attack on healthcare in the event of a series of continuous attacks on healthcare?

In some contexts, health facilities are attacked repeatedly within a short period (e.g., a group attempts to forcefully enter a facility but is unsuccessful; they return a few hours later with weapons and forcefully gain entry. In the interim, some but not all patients are evacuated). This makes it difficult to distinguish between attacks and their effects. We refer to this as a continuous attack.

- A prospective approach offers possibilities for real-time documentation of impacts, which could facilitate documentation of each attack and its impacts in one or a series of continuous attacks.
- If the time lag between attacks is short, a retrospective approach might only capture the cumulative impact of one or a series of continuous impact.

Note that it is also possible to use a combination of retrospective and prospective approaches.

5.3 Documenting versus measuring impact

Documenting implies that we explore, describe and explain the nature of the impacts produced by the attacks on healthcare. This consists of qualifying the impacts of attacks on healthcare to build a theory of impacts, for instance. Documentation can use qualitative or quantitative methods, or both (mixed methods).

Measuring implies that we quantify the scale of the impacts produced by the attacks on healthcare. We answer the question to what extent attacks on healthcare have contributed to decrease health services delivery, for instance. Measuring implies the use of quantitative methods.

When the primary objective of the study is to measure impacts (using quantitative methods), the use of qualitative methods is beneficial to explain how and why these impacts occur, and at such a scale (with implications of how we might mitigate the level of impact, for instance). For example, a dramatic decrease in the service utilisation rate occurs following an attack on a health facility, and continues over time. Plausible reasons for this decrease include:

- The population avoids the health facility because the facility is a target;
- The population does not attend the facility because drugs were stolen during the attack and are no longer available;
- The population flees the violence and is hiding in the bush.

Without qualitative data, it will be difficult to: (1) ascertain that the decrease in utilisation rate is caused by the attack on the health facility; (2) identify the reason for the low utilisation rate and its continuation over time; and (3) implement the appropriate mitigation measures to ensure that the population can access healthcare.

An important question here concerns **why we want to quantify the longer-term impact of attacks on healthcare.**

- If we do not, we might document it using only qualitative methods. This is the methodology adopted by most of the studies included in the literature review, in part because quantitative data are not always available.
- If we want to quantify the impact, quantitative methods need to be used to measure the impact. In addition, we should also consider qualitative methods to help **explain the nature and reasons for the observed impacts.**

5.4 Causation, Attribution, Contribution and Association

Some studies underlined the challenges of isolating the impact of an attack on healthcare as opposed to the broader effects on healthcare of armed conflict. These methodological challenges are reflected in the Delphi study that Afzal and Jafar (2020) conducted to

explore what information is needed to understand the impact of attacks on healthcare. Fifteen of the seventeen (88%) experts who completed the first round of the Delphi study agreed that there was a knowledge gap on how to distinguish the impact of the attacks on healthcare from the impact of the existing situation of conflict. Sixteen of the seventeen (94%) experts stated that methodological considerations to understand the impact of attacks on healthcare should include a comparison between attacked and non-attacked facilities, and a comparison between before and after the attack.

These recommendations raise the question of attribution: how can we be certain that the observed impacts are caused by the attack on healthcare? The observed impacts could be a result of the conflict itself, the volatile security situation, or any factor. There is a need to distinguish the impact on health services due to attacks on healthcare from the impact on health services due to the existing situation of conflict or singular events. Ideally we should aim to measure attribution and not limit ourselves to measuring association.

There are a few methodological solutions to this conundrum. The most common is to identify a comparison group, which would have the same characteristics of the group 'exposed' to the attack on healthcare, with the only difference that this comparison group was 'not exposed' to the attack. The objective is to accurately estimate what occurred as a result of the attack, in comparison to what would have occurred in the absence of the attack.

In a situation where no comparison group is available we could instead compare the values of measurements taken before the occurrence of the attack with the value of measurements taken after the attack (known as a before/after or pre/post study).

When choosing a study design, we should first ask:

- Do we want to measure the **association** between the occurrence of attacks on healthcare and the observed impacts?
- Do we want to measure the extent to which the observed impacts are **attributable** to the occurrence of attacks on healthcare?

Association shows the relationship between two or several variables. Association between two or several variables, however, is not a sufficient condition to establish causality. In the context of attacks on healthcare, there might be a strong association between the number of civilian casualties and the occurrence of attacks on healthcare, but civilian deaths might not be an *effect* of attacks on healthcare. Instead, the armed conflict itself could be the cause.

Causal inference is the process by which we make a judgement about whether an observed association is causal. Association can be a starting point to establish **causality**. Other

conditions include: 1) demonstrate that attacks on healthcare precede the observed effects; 2) assess the possibility of bias and confounding factors (rival explanations); 3) establish whether existing evidence supports a causal relationship? (Chambliss and Schutt, 2018). A strong association between the occurrence of attacks on healthcare and the observed impact could be corroborated by the findings of a qualitative study, for instance.

Although attribution and contribution are often used interchangeably, they are not the same. **Attribution** refers to the extent to which the observed impact is caused by the attacks on healthcare. **Contribution** implies that the overall impact might be larger than the portion of impact caused by the attacks on healthcare. In other words, contribution implies that there might be other factors contributing to the observed impact (Jenal and Liesner, 2017; Patton, 2012). To demonstrate that the impact is attributable to the attack on healthcare, causality needs to be established.

5.5 Choosing a study design

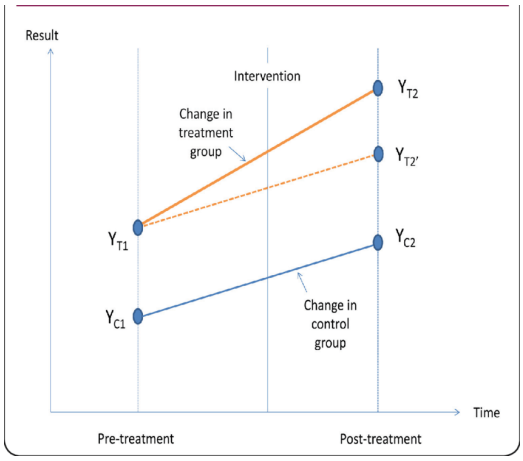
The selection of a study design should be guided first by the research question and second by what data are available.

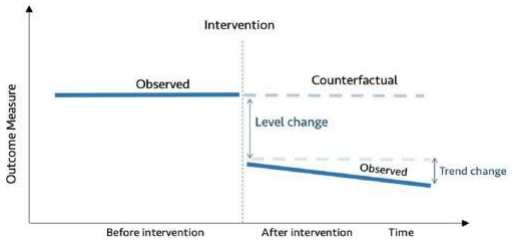
Table 11: Suggested Study Designs related to research question

Questions	Suggested study design
Study designs to measure estimates at one (or more) points of time	
Do we want to measure **an estimate** at a point of time (e.g. prevalence of a disease)? E.g: · Number of days essential medicines are out-of-stock (per medicine) in the last 3 months. · Number of days health services (per health service) have been interrupted in the last 3 months.	**Cross-sectional study**
Do we want to measure **an estimate at several points of time**? E.g: · Number of women delivering at health facilities during month 1, month 2 and month 3. · Number of days ambulance service was operational during month 1, month 2 and month 3.	**Longitudinal study**

Study designs to measure the strength of the association	
Do we want to study factors **associated** with a specific impact? (Is impact our starting point)? E.g. · What are the factors associated with healthcare worker attrition? · What are the factors associated with PTSD among healthcare workers? · What are the factors associated with loss-to-follow-up from antiretroviral treatment?	**Case-control study**, i.e. individuals with the outcome of interest (e.g. post-traumatic stress disorder among healthcare workers) are matched with a control group of individuals absent the outcome of interest. The researcher determines which individuals were exposed to the variables of interest (e.g. certain types of attacks or conflict-related traumatic events) in each of the study groups. Case-control studies determine the relative importance of predictor variables in relation to the presence or absence of the outcome of interest (e.g. the odds of having been abducted was 3 times higher among individuals with PTSD than controls). Has the impact already manifested? Yes: Retrospective case-control design No: Prospective case-control design
Do we want to study the **association** between the exposure and the outcome? (Is exposed/ unexposed group our starting point?) E.g. · What is the likelihood of delivering at a health facility for pregnant women living in catchment areas exposed to attacks on healthcare as compared to pregnant women living in catchment areas that have not been exposed to attacks on healthcare? · What is the relative risk of developing PTSD among healthcare workers exposed to attacks on healthcare as compared to healthcare workers who have not been exposed to attacks on healthcare?	**Cohort-study**, i.e. a group of individuals absent the outcome of interest is chosen (e.g. pregnant women who have not yet given birth). Among them, one group has been exposed to attacks on healthcare and the other has not, thereby acting as a control group (e.g. pregnant women living in a catchment area exposed to attacks on healthcare vs. pregnant women living in a unexposed catchment area). Cohort studies permit calculation of the probability of an event (e.g. delivering at health facility) in the exposed group versus the probability of the event occurring in the non-exposed group. For instance, pregnant women living in the catchment area exposed to attacks on healthcare are 20% less likely to deliver at health facility than pregnant women living in the unexposed area.

	Within this group, has the impact (outcome of interest) already manifested itself? No: prospective cohort study Yes: retrospective cohort study
Within our exposed group our cohort study (population of interest), do we want to look at factors **associated** with the outcome of interest? E.g. · Among healthcare workers [the cohort] who have been exposed to attacks on healthcare, what are the factors associated with PTSD? · Among pregnant women living in a catchment area [the cohort] exposed to attacks on healthcare, what are the factors associated with delivering at health facility?	**Nested case control study**, i.e. within one arm of the cohort (e.g. individuals exposed to attacks on healthcare), we explore the factors associated with the outcome of interest (e.g. PTSD). Individuals exposed to attacks who have developed PTSD are matched with individuals exposed to attacks who don't have the outcome of interest. The researcher determines which individuals were exposed to the variables of interest (e.g. certain types of attacks) in each of the study groups and then determines the relative importance of these predictor variables in relation to the presence or absence of the outcome of interest. (e.g. among healthcare workers who have been exposed to attacks on healthcare, the odds of having experienced hijacking is two times higher in healthcare workers who developed PTSD)
Quasi-experimental designs aiming at inferring causality (and measuring attribution)	
Do we want to estimate the impact of attacks on healthcare on one (or more) outcome(s) by comparing the outcome(s) for a population exposed to attacks on healthcare before and after the occurrence of attacks? E.g. · Comparing immunisation coverage of a catchment area before and after being exposed to attacks on healthcare. · Comparing the monthly number of days essential medicines are out-of-stock (per medicine) in a health facility before and after the occurrence of attacks.	**Before and after study** E.g. Immunisation coverage has decreased by 40% after an attack compared with the coverage prior.
Do we want to estimate the impact of attacks on healthcare on one (or more) outcomes by	**Difference-in-difference** (or controlled before and after study). The difference in

comparing the change in an outcome for a population exposed to attacks on healthcare and a population not exposed to attacks, before and after the occurrence of attacks? E.g. · Comparing antenatal care coverage of a catchment area exposed to attacks on healthcare to antenatal care coverage of a catchment area without exposure to attacks on healthcare before and after the attacks. · Comparing utilisation rate of a health centre exposed to attacks on healthcare to utilisation rate of a health centre without exposure to attacks on healthcare before and after the attacks.	the before-and-after outcomes for the group not exposed to attacks (the control: Yc2 - Yc1) serves as a control for factors that vary over time. Difference-in-difference = The difference in the before-and-after outcomes for the group exposed to attacks (the treatment: Yt2 - Yt1). · The difference in the before-and-after outcomes for the group not exposed to attacks (Yc2 - Yc1). Thus, DD = (Yt2 - Yt1) - (Yc2 - Yc1). E.g. The DD estimator shows that the monthly number of days that essential medicines were out-of-stock has highly increased in facilities exposed to attacks as compared to before the attacks. DD relies on the assumption that in the absence of exposure, the unobserved differences between the exposed and unexposed groups are the same over time. 
Do we want to estimate the impact of attacks on healthcare on one (or more) outcomes by comparing the change in the trends of an outcome for a population exposed to attacks on healthcare before and after the occurrence of attacks? E.g. · Comparing the change in the trends of immunisation coverage of a catchment area	**Interrupted times series (ITS)** Longitudinal data on the outcome of interest are used to establish a trend, which is 'interrupted' by an attack on healthcare at a known point in time. The hypothetical scenario under which the attack had not taken place and the trend continues unchanged is referred to as the 'counterfactual'. This counterfactual provides a comparison for the

<table>
<tr>
<td>before and after being exposed to an attack on healthcare.
· Comparing the trends in children under 5 treated for severe malaria before and after the attack on healthcare.</td>
<td>measurement of the impact of the attack on the outcome by examining any change occurring in the post-attack period. (For more information, see Bernal et al, 2016).
 
</td>
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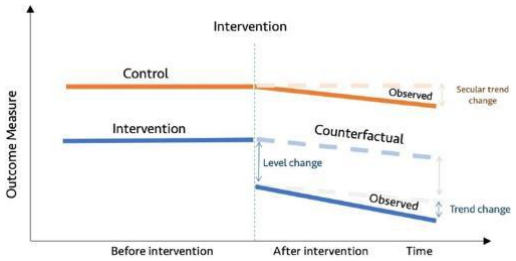
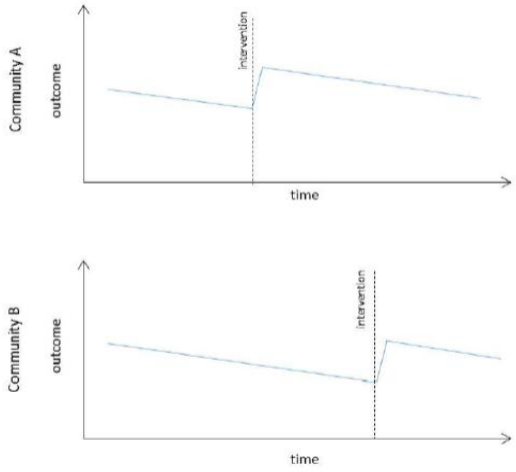
<tr>
<td>Do we want to estimate the impact of attacks on healthcare on one (or more) outcome(s) by comparing the change in the trends of the outcome(s) for a population exposed to attacks on healthcare to the change in the trends of the outcome(s) for a population without exposition to attacks on healthcare before and after the attacks?

E.g.,
· Comparing the change in the trends of immunisation coverage of a catchment area exposed to attacks on healthcare to the change in the trends of immunisation coverage of a catchment area not exposed to attacks on healthcare, before and after the attacks.</td>
<td>ITS cannot exclude confounding due to other events occurring at the same time of attacks. Controlled Interrupted Time Series (CITS) involves adding a control series (e.g.
 

catchment area not exposed to attacks) to the basic ITS design. CITS allows minimising potential confounding from other events. There is both a before-after comparison and a comparison between exposed and unexposed groups. A lack of effect in the group not exposed to attacks can provide stronger evidence to support a causal relationship between the attacks and the observed change in outcomes. (For more information, see Bernal et al, 2018).</td>
</tr>
</table>

Do we want to estimate the impact of attacks on healthcare on one (or more) outcome(s) by comparing the change in the trends of the outcome(s) for a population exposed to attacks on healthcare to the change in the trends of the outcome(s) for a population also exposed to attacks on healthcare but at a different time? E.g. · Comparing the change in the trend of health facility delivery in a facility exposed to attacks at Time 1 to the change in the trend of health facility delivery in a facility exposed to attacks at Time 2. · Comparing the change in the trends of motivation in healthcare workers from facilities that have been exposed to attacks on healthcare at different time.	**Controlled interrupted time series with a multiple baseline design** (similar to stepped wedge design). Following a baseline period (during which no population groups have been exposed to attacks), one population group is exposed to attacks on healthcare while one or more other population groups act as a control (not yet exposed to attacks). Control groups are subsequently exposed to attacks at different times. In this design, the observation of a similar effect on the outcome following an attack in multiple different groups at multiple sequential points in time can provide evidence that the observed impact is due to the attacks rather than other potential confounding events (For more information, see Bernal et al, 2017). 

For most cases above, the selection of the study design depends on the possibility of identifying a control group. The comparison group (control) could be:

- A health facility or the catchment area of a health facility that has not been exposed to attacks on healthcare.
- A group of healthcare workers who have not been exposed to attacks on healthcare.
- An outcome that has not been impacted by attacks on healthcare. For instance, in the case of the theft of the vaccine storage fridge, immunisation coverage is likely to be impacted by the attacks on healthcare whereas antenatal care coverage is less likely to be affected.

- A health facility or the catchment area of a health facility that has been exposed to attacks on healthcare but later (see controlled interrupted time series with multiple baseline design in the table above).

When selecting the control, we need to ensure that the control group shares the same characteristics as the exposed entity. In addition, we need to consider the spillover effects. For example, if the unexposed catchment area is a neighbouring catchment area of a facility exposed to attacks, there is a possibility of spillover effects (e.g., population seeking care to the non-exposed health facility).

Table 12 below presents the strengths and limitations of the different study designs and their relevance in measuring (vs documenting) the impacts of attacks on healthcare. Figure 3 below is aimed to guide the selection of study design according to the availability of data and possible comparison groups. However, **the selection of study design should primarily consider the research questions of the study**, as opposed to being driven by the availability of data.

Table 12 Strengths and limitations of the different study designs and their relevance in measuring (vs documenting) the impacts of attacks on healthcare.

Study design	Description	Pre-requisite	Assumptions	Strengths	Limitations	Relevance for the assessment of wider and longer-term impacts of attacks on healthcare
Cross-sectional study	Used to measure the estimate of a variable of interest at one point of time in one group of population. A common method for data collection is a survey.	Access to population to conduct survey (however could be done using secondary data)		· Simple to conduct · Relatively short in time · Does not require comparison group	· Difficult to interpret as not possible to answer whether the outcome followed the exposure in time · For rare outcome (e.g. maternal mortality), it requires a very large sample size in order to have a meaningful confidence interval. · Does not address the attribution/contribution question	· Could be nested in a broader approach (e.g. theory-based approach). · Could be used to retrospectively build baseline data asking people to recall data from before the attacks.
Longitudinal cross-sectional study	Used to calculate the value of a variable of interest (mainly in percentage) at	Repeated access to the same population to conduct a survey at different points of		· Simple to conduct · Does not require comparison group	· Does not address the attribution/contribution question.	· Could be nested in another study design (e.g. interrupted time

	different points of time in the same population, allowing the calculation of trends.	time (however could be done using secondary data).			· Unsuitable if the population characteristics change over time (e.g., displacement of population).	series) and used to build baseline data including a trend. · Might not be suitable if the population mostly affected by attacks on healthcare (medical staff, patients) change location over time.
Case-control study	Cases are selected on the basis of their outcome/characteristic (e.g. disease status): one group with the characteristics (case/treatment group), one group without the characteristic (control group).	· Knowing the outcome of individuals. · Selection of appropriate comparison group (without the characteristic).		· When a condition (disease) is known to be rare, case control study is likely to be the most appropriate design. · Many different exposures can be measured. · Allow to measure the association between the predictor variables and the exposure. · Relatively cheap.	· Limited to one outcome. · Vulnerable to selection bias. · Vulnerable to temporality bias (whether outcome precedes exposure or exposure precedes outcome is difficult to establish). · May not be adequate to investigate rare exposure.	· Could be relevant if researchers have a specific impact of interest. · Could be nested in a cohort study to investigate in detail why some exposed individuals develop certain outcomes while other do not (nested case-control).
Prospective cohort studies	Subjects are selected on the basis of their exposure to attacks on healthcare: one	· Knowing who is exposed. · Selection of appropriate		· When the exposure is rare, it might be the most	· Sensitive to loss of follow up. · Cannot be certain that all individuals	· With new communication technologies, it is easier to follow

	group has been exposed to attacks on healthcare, the other group, called the comparison group has not been exposed to them. These two groups are followed over time to see which ones develop condition (e.g. PTSD). Cohort studies allow calculation of the relative risk of outcome in the exposed cohort compared to that in the unexposed group.	comparison group (unexposed). · Requires data on matching variables.		appropriate study design. · Allows the measurement of associations between the exposure and the outcome. · Has the ability to look at multiple outcomes. · Provides detailed investigation of time sequences between exposure and onset of impact.	are free of disease before being exposed to attacks on healthcare. · Vulnerable to selection bias. · Vulnerable to information bias (individuals from the unexposed group might become exposed over the period of the cohort study). · Long-term and more resource-intensive in general.	individuals, but loss of follow-up could still occur in case of death, displacement, loss of phone, etc. · Could apply particularly well to medical staff to assess the impacts on their mental health. · Should cover at least one year to take account of seasonality – outcomes might differ from one season to another (e.g. malaria is more prevalent during rainy season). · Could match individuals in each group to limit selection bias. · Risk of unexposed population becoming exposed over the time of

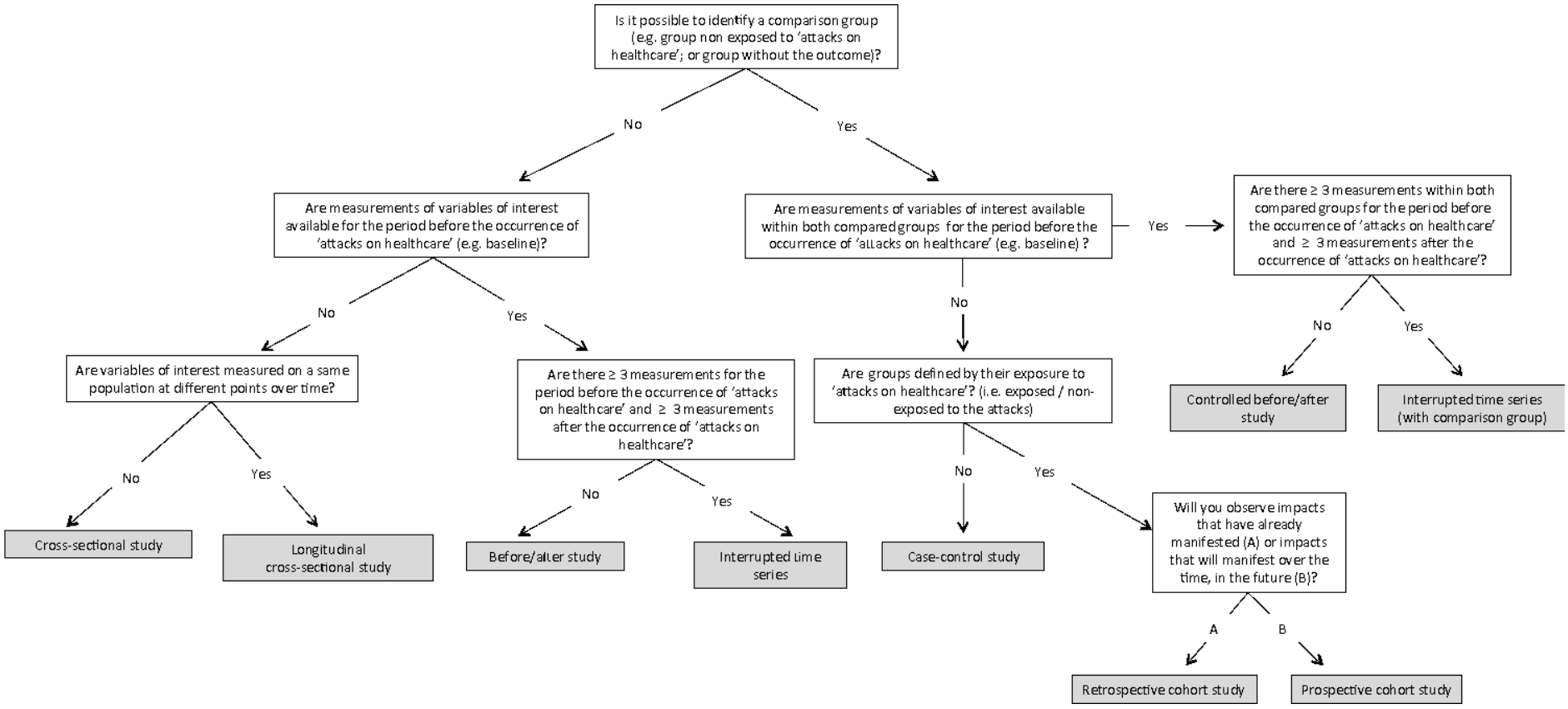
						the cohort study; or exposed medical staff moving to an unexposed geographical zone.
Retrospective cohort study	Same as prospective cohort study above except retrospective cohort studies rely upon records of exposure and outcomes in individuals from the past.	· Same as prospective cohort study above. · Availability of secondary data on exposure and outcomes in individuals from the two groups.		Same as prospective cohort above.	· Same as prospective cohort study above. · Poor quality of secondary data or secondary data destroyed during the attacks.	· Same as prospective cohort study above
Before/after study	The value of variable of interest is compared before and after the attacks on healthcare.	Baseline data	· Baseline data and after attacks data need to be collected within a short/close timeframe to limit confounders.	More robust than cross-sectional study.	· Does not address with certainty the attribution/ contribution issue, as it is impossible to rule out the possibility that any observed impacts might have occurred irrespective of the attacks on healthcare (unless we have good reason to know what the effects of other influential	Could be relevant to measure immediate impacts (the less time lag there is between two measurements the fewer confounding factors are likely to exist).

					events would have been). · Vulnerable to information bias. · Characteristics of the population before and after attack on healthcare may have changed – e.g. affected individuals may have died or migrated.	
Controlled before/after (difference – in-difference)	Same as before/after study except that the value of variable of interest is measured in both exposed and unexposed group.	· Baseline data and endline data. · Comparable exposed and unexposed group. · Requires data on matching variables.	The change in the two comparison groups would have been the same over time, had one of them not experienced an attack.	Addresses the attribution question	· Vulnerable to selection bias. · Vulnerable to information bias. · Characteristics of the population before and after attacks on healthcare may have changed.	Relevant to measure longer-term impacts of attacks on healthcare provided that a comparable unexposed group is identified.
Interrupted time series	The value of the variable of interest is measured more than two times before and after the attack on healthcare to compare trends of values before.	· Baseline data at more than two points of time. · Data collected at more than two points of time after the attack.		· More robust than longitudinal cross-sectional study. · More robust than before/after study.	· Does not address with certainty the attribution/ contribution as it is impossible to rule out the possibility that any observed impacts might have	· Relevant to measure longer-term impacts of attacks provided that impacts do not manifest themselves a long time after attacks

		· Baseline data and after attack data need to be collected in a close time to limit confounders. · Trends need to be predictable, otherwise it is difficult to predict a counterfactual.			occurred irrespective of the attacks on healthcare. · Characteristics of the population before and after attacks on healthcare may have changed e.g. affected individuals may have died or migrated. · Vulnerable to information bias	(the risk of confounding factors would be higher), and provided that singular events that could influence the outcome are investigated.
Interrupted time series (with comparison group)	Same as interrupted time series except that the series of values of the variable of interest is measured in both exposed and control group.	· Baseline and endline data at more than two points of time. · Must know who is exposed. · Requires comparison group. · Requires data on matching variables. · Parallel trends between exposed and unexposed groups.	· Parallel trends between exposed and unexposed groups. · Risk that the change in the two comparison groups would have been the same over time, had one of them not experienced an attack.	Address the attribution question.	· Vulnerable to selection bias. · Vulnerable to information bias. · Characteristics of the population before and after attacks on healthcare may have changed e.g. affected individuals may have died or migrated.	· Relevant to measure longer-term impacts of attacks provided that singular events that could influence the outcome are investigated and a comparable control group exists.

Figure 3. Decision tree to help selecting a study design according to the availability of data and possibility of comparison group

Note: for interrupted time series and controlled interrupted time series, the number of measurements required will depend on the outcome and their variation over time (e.g. an outcome that is volatile according to seasonality will require more measurement points)



5.6 Theory-based approaches

A final option is to use a combination of designs and methods to demonstrate the contribution of attacks on healthcare to observed impacts. Theory-based approaches offer this possibility. While the study designs described above focus on measuring the magnitude of the impacts, some approaches instead focus on exploring the causal mechanism through which a phenomenon (in our case, attacks on healthcare) produces impacts, and how the context influences this causal mechanism. The analysis of how the context influences the emergence and evolution of different types of impacts is key to understanding whether similar effects would be observed in the case of a similar type of attack on healthcare in a different context.

Theory-based approaches usually use a logic model or a 'theory of change' as the basis. In our case, it would be a theory of impacts. The theory of impact would map out the causal chain from the occurrence of attacks on healthcare to immediate, intermediate and long-term impacts (Figure 2), and the underlying assumptions (i.e. the hypothesis that needs to be tested; the conditions that needs to be fulfilled for the causal link to be established). For instance, in Figure 2, for an international relief organisation to manage health facilities remotely, the underlying assumption is that national staff remain and continue working after the bombing. The theory of impact also needs to specify the context in which the causal chain evolves explicitly. By context, we mean the social, political and economic settings in which an attack on healthcare occurs and could influence the causal chain, or anything external to the attack that could reduce or strengthen its impacts.

In order to test, validate or discard underlying assumptions, theory-based approaches usually use a combination of study designs and mixed methods (quantitative and qualitative). Study designs that aim to quantify impacts may identify issues that require qualitative exploration, while qualitative data can be used to generate theory to be tested quantitatively. For instance, data from medical staff interviews may converge and suggest that attacks on healthcare deterred pregnant women from coming to health facilities for antenatal care visits. We could test this hypothesis quantitatively by looking at the change in antenatal care attendance before and after the attacks.

Theory-based approaches include (but are not limited to) contribution analysis and process tracing (Befani and Mayne, 2014), and realist evaluation (Moore et al, 2015). These approaches converge in their application of a logic model to map out the cause-effect chain and the underlying assumptions. They all examine the influence of contextual factors on the mechanisms of the cause-effect chain. However, they diverge in approaches to verifying the plausibility of assumptions. For instance, contribution analysis emphasises that there are often many factors contributing to the observed outcome, and will focus on looking at the relative importance of those factors, while process tracing is more focused on deciding which of a series

of alternative explanations is correct by grading strengths of assumptions from low to high and ruling out rival assumptions.

Contribution analysis could be especially appropriate to study the wider and longer-term impacts of attacks on healthcare. In conflict settings, attacks on healthcare are unlikely to be the only factor influencing the observed impacts. Multiple factors (events) related to the conflict itself are likely to contribute to the observed impacts. This is compounded by the fact that longer-term impacts sustain over a long time period or manifest themselves after a long time period. As such, they are much more likely to be influenced by several cumulative events (Patton, 2012). Contribution analysis would allow demonstrating *to what extent* and *in what ways* the attacks on healthcare contributed to the observed impacts, recognising that they are other contributions to the observed impacts.

6. Conclusion

This working paper brings together the knowledge of researchers from the RIAH consortium and their experience in conducting research on documenting attacks on healthcare and their impact. It invites researchers planning to conduct such studies to consider a set of conceptual questions and has a vocation to help them anticipate a range of challenges. While in recent years, initiatives to document instances of attacks on healthcare have multiplied, research aiming at documenting and measuring their impact, and more particularly their wider and longer-term impact, is still in its infancy. While attempting to lay the foundations for what is meant by wider and longer-term in the context of attacks on healthcare, and proposing methodologies for documenting and measuring them, this working paper is aimed to be dynamic. As is evident from the above discussion the conceptual issues affecting documentation of instances of attacks on healthcare, as well as documentation and measurement of their impact are complex, multifaceted and interdependent. As we engage in case studies to both document and measure impact, we will return to and update this document, integrating the lessons learnt, in order to contribute to our collective understanding about the effects of attacks on healthcare on populations, health services, and health systems, and their consequences beyond the health sector.

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