

The 12 dimensions of health impacts of war (the 12-D framework): a novel framework to conceptualise impacts of war on social and environmental determinants of health and public health

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ABSTRACT

Global rates of armed conflicts have shown an alarming increase since 2008. These conflicts have devastating and long-term cumulative impacts on health. The overriding aim in these conflicts is to achieve military or political goals by harming human life, which is the antithesis of the moral underpinnings of the health professions. However, the profession has rarely taken on a global advocacy role to prevent and eliminate conflicts and wars. To assume such a role, the health profession needs to be aware of the extensive and multiple impacts that wars have on population health. To facilitate this discourse, the author proposes a novel framework called 'The Twelve Dimensions of Health Impacts of War' (or the 12-D framework). The framework is based on the concepts of social and environmental determinants of population health. It has 12 interconnected 'dimensions' beginning with the letter D, capturing the adverse impacts on health (n=5), its social (n=4) and environmental determinants (n=3). For health, the indices are Deaths, Disabilities, Diseases, Dependency and Deformities. For social determinants of health, there are Disparities in socioeconomic status, Displacements of populations, Disruptions to the social fabric and Development reversals. For environmental determinants, there is Destruction of infrastructure, Devastation of the environment and Depletion of natural resources. A relatively simple framework could help researchers and lay public to understand the magnitude and quantify the widespread health, social and environmental impacts of war, comprehensively. Further validation and development of this framework are necessary to establish it as a universal metric for quantifying the horrific impacts of war on the planet and garner support for initiatives to promote global peace.

INTRODUCTION

With nation-states on a firm foundation, extraterritorial conflicts appear to be a key feature of violence on a global scale. An

SUMMARY BOX

- ⇒ There is an alarming increase in the global rates of armed conflicts that have multiple cumulative impacts on health, both in the short and long-term.
- ⇒ The framework 'Twelve Dimensions of Health Impacts of War' or the 12-D Framework describes these impacts using a social and environmental determinants approach.
- ⇒ The framework is a tool to understand and quantify widespread health impacts of war, and may help target measures to minimize potential adverse impacts.

extraterritorial conflict is described as an external conflict when there is an inter-state armed conflict or when an internal conflict has been internationalised. A war is defined as a conflict with more than 1000 battle deaths per year.¹ At a global level, external conflicts have recorded the largest deterioration of all indicators since 2008, worsening by over 50%.² A total of 122 countries have been involved in at least one external conflict since 2008, although mainly as part of a broad coalition with a relatively minor commitment of resources. This paper focuses on extraterritorial conflicts and uses the term 'war' to denote all forms of inter-state or internationally internalised conflicts that involve physical aggression. We believe the term 'war' captures the imagination of the public and hints at violence that is organised on a larger scale and intensity rather than terms such as 'conflicts' and 'violence'.³

Wars are devastating for population and individual health because their overall deliberate intention is to destroy or maim human life as a means to achieve an objective or a goal. The immediate precipitating factors

of war are often related to a combination of motives, such as capturing geographic territory, gaining control over resources (eg, oil) or subjugating a population. There have been many attempts to view wars as public health catastrophes and to establish governance mechanisms to eliminate war between states, eg initiatives by the Institute for Economics & Peace in Australia and the Department of Peace and Conflict Research at Uppsala University in Sweden.^{4 5} The author has also advocated, although unsuccessfully, for the elimination of all wars as a target in the Sustainable Development Goals, as an initiative by the British Commonwealth and as a global action for peace.^{3 6 7} However, these initiatives have not triggered interest among the wide segment of academics, and health professionals. This disinterest is especially noticeable in the global south or less-developed countries, which is ironic since most inter-state wars affect these regions.²

HEALTH IMPACTS OF WAR

Armed conflicts directly kill, injure, maim and destroy life. Wars are positively associated with an increase in all-cause mortality due to widespread impacts on health and healthcare. The presence of non-communicable diseases, cancers, communicable diseases, maternal, neonatal and nutritional diseases, all contributed to increased civilian deaths associated with wars.⁸

Wars could be viewed as an organised attempt to kill fellow humans while destroying or degrading millions of human lives knowingly and deliberately, the very antithesis of the morals or codes of conduct of health professionals who are ethically bound to improve well-being of fellow humans and avoid deliberate harm. Therefore, the relative lack of interest among health professionals in opposing all forms of violence and wars is surprising.

The relative disinterest on health issues generated by wars is observed even in organisations that are active in health issues at a global scale and some reports on health and human development rarely discuss the impact of wars. Terms such as violence, conflicts and human

rights violations are used instead, as if there is deliberate attempt to shy away from using the word ‘war’. This situation could be partly explained by its governance structures and processes. It is well known that the current global order and United Nations (UN) system is dominated by a powerful United Nations Security Council (UN-SC) and other UN organisations, such as the WHO, United Nations Development Programme and UNESCO, are effectively excluded from discussing the topic of wars and inter-state conflicts. The decisions of the UN-SC are shaped by six of the most powerful nations who hold veto powers on all matters of war, peace and security. Coincidentally, these very self-appointed nations collectively stockpile most of the nuclear weapons and are the most prolific manufacturers of lethal weapons.³

Initiatives such as the Sustainable Development Goals in 2015 and more recently Global Health Security (GHS) popularised by the WHO and UN system were lost opportunities to address health issues related to wars.³ The dilution of health impacts of war is illustrated in some of the documents related to GHS, defined as ‘the activities required, both proactive and reactive, to minimise the danger and impact of acute public health events that endanger people’s health across geographical regions and international boundaries’.^{9 10} Its objectives include the promotion of ‘social stability, global public goods, equity or social justice, and recognising shared responsibilities by governments across national boundaries’.¹¹ However, subsequent sentences narrow down this overarching approach and begin to focus on impacts of microbes, vectors and invasions by diseases, instead of including a broader canvas of issues of security such as wars. This is operationalised by the GHS Index 2021, which is used to assesses the severity of security risks of countries using 6 categories, 37 indicators and 171 questions. Five of the six categories of GHS, ie prevention, detection and reporting, rapid response, health system, compliance with international norms, mainly focus on infectious threats such as antimicrobial resistance, zoonotic diseases, infection control practices and

Table 1 Questions under the sub-categories relevant to war

Subcategories	Questions
Orderly transfers of power	How clear, established and accepted are constitutional mechanisms for the orderly transfer of power from one government to another?
Social unrest	What is the risk of disruptive social unrest?
illicit activities by non-state actors	How likely is it that domestic or foreign terrorists will attack with a frequency or severity that causes substantial disruption?
	What is the level of illicit arms flows within the country?
	How high is the risk of organised criminal activity to the government or businesses in the country?
	What is the level of illicit arms flows within the country?
Armed conflict	How high is the risk of organised criminal activity to the government or businesses in the country?
Armed conflict	Is this country presently subject to an armed conflict, or is there at least a moderate risk of such conflict in the future?
Government territorial control	Does the government’s authority extend over the full territory of the country?
International tensions	Is there a threat that international disputes/tensions could have a negative effect?

Table 2 The relationship of the 12-D framework to social and environmental determinants

The 12-D framework	Social determinants listed in reputed texts and resources			
	Solid facts ¹⁴	WHO ¹⁵	Canada ¹⁶	Key textbook ¹⁷
Death	Commonly used matrix for health outcomes			
Disabilities				
Diseases	Stress			Stress
Dependency	Addiction		Healthy behaviours	
Deformities			Biology and genetic endowment	
Disparities	Social gradient		Income and social status	
Displacement		Social exclusion		Social exclusion
Disrupting the social fabric	Early life	Early childhood development	Childhood experiences	Early life
		Education	Education and literacy	
	Work, unemployment	Unemployment and job insecurity	Employment	Labour market
		Social exclusion		Social cohesion and psychosocial environment
	Social support	Social protection	Social supports	Social support
Development reversals		Discrimination	Culture Race/racism	
		Working life conditions	Working conditions	
Destruction of infrastructure		Income and education		Poverty
		Health services	Access to health services	Neighbourhoods
	Transport	Housing		
Depletion of natural resources		Basic amenities		
	Food	Environment	Physical environment	Food

biosecurity.¹² The sixth category termed ‘Risk Environment’ has the potential to capture war as a risk to global public health security since it deals with determinants such as political and security factors. It has five indicators, and the most relevant is the indicator ‘Political and Security risks’, which in turn has seven subcategories: government effectiveness, orderly transfers of power, risk of social unrest, illicit activities by non-state actors, armed conflict, government territorial control and international tensions. See below (table 1).

Its last subcategory is ‘International tensions’ draws attention to ‘inter-state wars’ by posing the question, ‘Is there a threat that international disputes/tensions could have a negative effect?’ This indirect and twisted approach observed in the literature could be viewed as an attempt to shy away from addressing one of the most important public health catastrophes imposed on humanity by humans, that is, wars. It is in this context that the 12-D framework was developed with the goal to raise awareness to the multidimensional health-related impacts of wars.

DEVELOPING THE 12-DIMENSIONS OF WAR FRAMEWORK

The author used social and environmental determinants of health as a framework to identify the health impacts

of war and a literature review from the war in Iraq to identify the impacts of war on public health.¹³ The individual parameters were initially identified based on the literature and readings on the adverse impacts of war on social and environmental determinants of health. Key textbooks and publications of governments and WHO were perused for this purpose.^{14–17} The intention was to develop a simple, easily recallable and acceptable set of dimensions that would help engage the public to sway their opinion on wars. Having reflected on the literature, the author conceived the 12-Dimensions of War Framework (table 2).

As a further refinement, the public health-related impacts of war were explored through a review of systematic reviews related to the Iraq war. The PubMed database was searched using the following search terms.

((war [Title/Abstract]) OR (conflict [Title/Abstract]) OR (invasion [Title/Abstract])) AND (health [Title/Abstract]) AND (Iraq [Title/Abstract]) AND (systematic review [Title/Abstract]). Filters: Abstract, Full text

There were 18 articles. The full text was perused by the author to identify all the adverse health impacts of war. Eight reviews gave information relevant to the impacts of the Iraq war on public health, and its social and environmental determinates. List of elements in the 12-D

Table 3 Elements in the 12-D framework covered in the review of systematic reviews

The 12-D framework	Impacts on public health concluded from the review of systematic reviews on Iraq
Death	Average deaths per day ranged from 48 to 759. The cause-specific mortality rates attributable to violence ranged from 0.64 to 10.25 per 1000 per year. There was also higher rates of childhood mortality. ⁴⁰
Diseases and disorders	Multisymptom illness (MSI): Higher prevalence among Gulf War veterans. ⁴¹ Mental illness Prevalence of post-traumatic stress disorder in children and adolescents is estimated to be 10%–30% in Iraq. Other illnesses noted: major depression, attention-deficit hyperactivity disorder, specific phobia, oppositional defiant disorder, generalised anxiety disorder and obsessive-compulsive disorder. More than 80% of 2-year-olds to 7-year-olds had separation fears, >60% had strong reactions to noise, anxiety, fears and nervousness, agitation or aggressiveness, high-risk behaviours in adolescents. ⁴² However, the Post-Traumatic Growth Inventory found moderate growth. ⁴³
Dependency	Alcohol and substance use: Pooled analysis based on a random-effects model yielded higher risk for alcohol and substance use disorders among Iraq/Afghanistan veterans. ⁴⁴
Deformities	Congenital birth defects Thirty studies (83%) reported a positive association between uranium exposure and adverse birth outcomes, though they suffer from a high risk of bias. ⁴⁵ Pregnancy outcomes Higher risk of small for gestational age and a lower 5 min Apgar score. ⁴⁶
Destruction to infrastructure	Health infrastructure Maternal and neonatal health services adversely affected during recurrent crises. ⁴⁷

framework covered in the review of systematic reviews is given in [table 3](#).

It showed that the 12-D framework was more comprehensive than the public health issues identified by the review of systematic reviews. Therefore, another limited literature search was made in PubMed using the elements of the framework as key words in relation to war or conflict, to see if there were examples of publications confirming the validity of the 12-D framework ([table 4](#)).

Definitions, further validation and measurements of 12-D framework

This section derives the final list of dimensions in the 12-D framework, with a short description and measurement indices used to express its magnitude or severity. These are categorised as impacts of wars on public health, and on its social, and environmental determinants. Each can be measured as raw numbers (eg, number of deaths) or as a rate (eg, number of deaths per 100 000 population) or as standardised prevalence rates. Data on raw numbers are

especially relevant to estimate the magnitude of impacts, while the latter two allow for comparisons across conflicts.

- 1. Death** (ie, mortality): A key measure is to estimate the number of deaths for each year the conflict went on, or across the duration of a conflict.¹⁸
- 2. Disabilities** (ie, from acute injuries): A disability is a limitation to normal activities from an injury that requires medical care, and often measured as rates per population.¹⁹
- 3. Disorders and Diseases:** This is an extensive category and includes mental illness (eg, depressive illness, anxiety, post-traumatic stress disorder, suicidality), long-term undernutrition and physical diseases (eg, infections).^{20–23} Infections seen during or after wars are mainly respiratory tract infections, diarrhoeal diseases, measles, malaria, cholera, dysentery, meningitis, relapsing fever, typhus, tuberculosis and HIV/AIDS. These are important during wars in resource-depleted combat zones and in refugees. Disorders and diseases

Table 4 Impacts on public health obtained from the literature (see text)

The 12-D framework	Impacts on public health concluded from the literature
Disabilities	Blast and gunshot injuries. ⁴⁸ Paralysis, amputation, loss of function and brain trauma. ⁴⁹
Disparities	Inequalities in access to health as well as outcomes. ²⁷
Displacement	More than 10 million refugees cross to Poland from Ukraine in 1 year. ⁵⁰
Disrupting the social fabric	Post-conflict mental health issues from multiple causes, including social crises. ^{20 51}
Development reversals	War adversely impacts education of children in Syria and Yemen. ^{52 53}
Devastation of the environment	Decline in wildlife, especially larger mammals in Africa after wars. ⁵⁴ Ukraine–Russian war and its impacts on environment. ⁵⁵
Depletion of natural resources	Russia–Ukraine armed conflict disrupts water systems. ⁵⁶

are measured as morbidity rates, or numbers affected or death rates from an illness.²³

4. Dependency on alcohol, tobacco and illicit drugs requires a clinical diagnosis of the condition.²⁴ The indices use to measure are age-standardised prevalence of alcohol dependence per 100 000 people, illicit drug (ie, cannabis, opioids, amphetamines and cocaine) dependence per 100 000 people and cigarette smoking per 100 000 people million.²⁵
5. Deformities (ie, physical and mental 'deformities', including birth defects and learning difficulties) that arise from birth defects attributed to war. These are detected by clinical examination and expressed as rates per 100 000 live births.²⁶

The second cluster are related to social determinants of health:

6. Disparities in socioeconomic and health. These include the widening inequalities in income, healthcare provision and health status of population groups.²⁷ Broadly, the measurements are either expressed as absolute differences in the rates of a health status, or as relative inequalities using ratios or concentration indices.²⁸
7. Displacement is defined as 'a process in which people are compelled to flee or to leave their homes or places of habitual residence in order to avoid the effects of armed conflict and find themselves in another part of the country or abroad'. Measurements include absolute numbers displaced to assess magnitude, and numbers displaced per 100 000 population which is useful for comparisons across regions.²⁹
8. Disrupting the social fabric including severed social networks and acculturation (ie, social capital). Social capital is defined as 'features of social organisation, such as networks, norms, and trust, that facilitate co-ordination and cooperation for mutual benefit' and measured through 'social cohesion (ie, density and nature of networks and levels of commitment by members), and trust (ie, propensity for corporation and exchange)'.³⁰
9. Development reversals relate to human and social development indices. For example, reversal of education is well known in conflict situations.³¹ Education especially childhood education forms key elements in the calculation of the Human Development Index (ie, mean years of schooling is one of the indices used to estimate HDIs) and is Goal-3 in Sustainable Development Goals, ie Quality Education.^{32 33} Targeted destructions of social infrastructure with long-term implication may not be obvious unless they are captured in our descriptions of wars. An example is 'scholasticide' or systematic destruction of education which is alleged to be in operation in Gaza where 12 universities and 378 schools have been bombed or destroyed.³⁴

The third cluster is relevant to the environmental determinants of health:

10. Destruction to infrastructure: transport, energy, housing and health are the key areas. Several indices

are available to measure their destruction. Transport: km of roads and bridges and overpasses. Energy: Electricity generation, power transmission, gas distribution and oil refinery facilities. Housing: Residential units, single-family houses and dormitory units.³⁵

11. Devastation of the environment from direct effects of wars as measured by impact on forests cover, air pollution and soil degradation from contamination. Impact of deforestation has recently been measured using satellite-based monitoring. Air pollution and contaminants are assessed using standard indices of pollution.^{36 37}
12. Depletion of natural resources, especially that of water. The impact on the provision of clean water is measured using a number of water-transfer interruptions, disruptions to the functioning of the hydro-electric station, surface-water pollution from military actions, damage to dams, mines overflowing and pollution.³⁸

IMPLICATIONS

The lack of a comprehensive matrix ignores important adverse impacts of wars on society. The proposed 12-D framework for health impacts would be a starting point to develop a matrix that could be applied universally to all armed conflicts. This could be relevant in any future attempts to garner support against armed conflicts.

The objective of the study was therefore to develop an inclusive framework that focuses on wars with external actors and covers the impacts of wars on public health and its social and environmental determinants. This approach is different from other frameworks using disease-based classification, health system-based impacts or a combination.³⁹ A captivating framework such as the 12-D would encourage or push the public, civil society and other pro-peace groups to understand the enormous impacts of war. Humanity needs a fresh goal for global peace to prevent millions of innocent victims destined to die from wars in the future.

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Manuscript Title: The 12 Dimensions of Health Impacts of War (The 12-D Framework): A Novel Framework to Conceptualise Social and Environmental Determinants of Health and Public Health

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