

## Predicting the Unthinkable: health impact assessment and conflict

### A case study to assess the potential health consequences of military action against Iran



*War and violent conflict have a profound effect on health. War causes damage to families, communities, and societies, which reverberates across generations. Both combatants and civilians who become casualties of war manifest physical, neurologic, and psychiatric injuries from direct contact with violence, which have vast economic and social costs. Massive indirect health effects include those from infectious disease, malnutrition, and population displacements. Destruction of health infrastructure, loss of health workers, and contamination of the environment also affect the health of populations, while the diversion of resources to building weapons and waging war depletes funds that could otherwise be spent on improving health.*

from Bartlein et al. 2013. Staging a Conference to Frame War as a Public Health Problem. *Social Medicine*. 2013;7(3).

## 1. Introduction

A structured assessment of the health impact of armed conflict, when this is being considered as one course of action, should be used to fully inform policy makers of the consequences of their decisions and encourage them to pursue all peaceful options. If the potential health effects were identified as accurately as possible, we argue that they should be a strong influence on the decision making process; however a full picture of these consequences is rarely presented. Health Impact Assessment (HIA) methodology provides a strong framework for this assessment, but has not been used in relation to conflict, although the potential for its use in relation to foreign policy has been recognised (Lee 2006).

This analysis of the potential health consequences of military action against Iran offers a case study of the use of HIA methodology, in a situation where military action has not been taken 'off the table'. It aims to inform policy and decision makers of the potential health consequences of military action against Iran. It was carried out by Medact, an organisation with extensive experience in documenting the health consequences of violent conflict (Medact 2004; Medact 2008). Considerable work has been done by researchers and others to increase the accuracy of health information and data collected during and after conflict (Haar 2012), and this offers a rich source of evidence which could contribute to making the best possible estimates of the health effects that would result in similar places and situations.

The Gothenburg Consensus Statement gives the most commonly cited definition of a HIA as being: *'...a combination of procedures, methods and tools by which a policy, programme or project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population.'* (European Centre for Health Policy 1999)

This definition clarifies that HIA uses different methods and approaches to reach a judgement about the ways a proposed policy will affect the health of a particular population. HIAs aggregate and triangulate diverse data sources to examine often complex policies and proposals. This means there are likely to be decisions to be made about the most likely outcome.

Other definitions stress that health effects are estimations made on the most robust evidence available, and that they can be useful in areas where health has not traditionally been given much weight (Birley 1995; Lock 2000). Accuracy is particularly challenging when looking at the health impacts of conflict; and it appears that the full health consequences of military action have rarely been given the weight they should be afforded by decision makers.

HIAs, unless designed for a specifically targeted purpose, use the definition of health given in the World Health Organisation (WHO) constitution of 1948: *'a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity'*. This captures the often neglected longer term and less visible consequences of violent conflict. This HIA includes impacts on the social and economic determinants of health, as described in WHO's Eastern Mediterranean Region publication on the social determinants of health in conflict (WHO 2008a), which can have devastating and longer term effects on health, particularly of vulnerable groups.

Various military scenarios have been talked and written about; this assessment is largely based on what is thought to be the most likely as described in section 3a. References to others are made where it is considered particularly relevant. The most likely scenario described below is limited to air strikes, and does not include an assessment of a conflict that escalates into a land war, so there is a danger of underestimation.

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Considering different military scenarios raises the ethical challenge of appearing to imply that certain consequences are 'acceptable', for example a smaller number of dead is somehow acceptable as it is better than a larger number. At no point do we imply that any of the health consequences detailed here are acceptable.

This assessment follows the classic steps of a health impact assessment:

- screening: deciding whether to undertake a HIA
- scoping: deciding the focus, methods and work plan
- information appraisal and identification of the health impacts: identifying the potential health effects
- conclusions and recommendations: outlining steps to minimise the adverse health effects
- reporting: presenting the findings to decision makers
- monitoring and evaluation: process evaluation to determine the effectiveness of the assessment; following up the policy intervention as appropriate.

As above this assessment has been carried out by Medact, an organisation with considerable experience in documenting the health consequences of violent conflict (Medact 2004; Medact 2008.) In 2002 prior to the invasion of Iraq, Medact produced a report on the likely health consequences should the invasion take place (Medact 2002). The predictions made in that report regarding morbidity and public health were broadly accurate, particularly in relation to a weakened health infrastructure, shortages of medical supplies, and other humanitarian consequences. Predictions of the numbers immediately displaced were less accurate. Estimations of the effects on psychosocial health are tragically still being proved correct (Medact 2012). It is harder to assess the accuracy of mortality predictions as these are still disputed and the predictions made in the report were based on a three month period, while surveys carried out post invasion used different time frames.

## **2. Screening – why an HIA should be carried out in this case**

The governments of the United States and Israel have made it clear that military action against Iran is a possibility (Katzman 2013; Times of Israel 2013). The UK government keeps 'all options on the table' (Hopkins 2011) but has stressed they would prefer the diplomatic option. Concerns are invariably linked to Iran's nuclear power programme, and its perceived potential to produce a nuclear weapon, although many other aspects of international relations also play a part.

The health effects of violent conflict are estimated in various ways by a diverse range of actors including health workers, weapons designers, campaigners, academics, governments, economists and the military. The UK armed forces, for example, assess the likely impact of a potential conflict on their troops, and to a lesser extent on enemy troops. The HIA has the potential to provide a comprehensive framework for data and information, and an overall picture for the most likely outcomes.

While every conflict is unique, there is strong evidence from recent military campaigns that the health impacts of military action against Iran would be severe for all sectors of society. The health of the chronically sick, for example, is already negatively impacted by sanctions that prevent the

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financial transactions necessary for the import of some medicines, and the constituent products of others (Section 4fi); the health of these people is likely to be severely affected by further disruption. The effects of a disrupted power supply on water, sanitation and refrigeration in a country with the level of infrastructure of Iran is likely to be devastating for immunisations and other aspects of maternal and child health (Section 4g). Those displaced by a military campaign would suffer all the psychosocial consequences of loss of home, known environment and social networks, as well as physical deprivations (Section 4i). These are just some of the reasons why a more rigorous assessment of health impacts is not just worth carrying out, but essential.

A full picture of the health consequences of military action is likely to influence decision makers. The health consequences of military action or violent conflict for civilians are unanimously viewed as negative, and governments try – with varying degrees of effort and success – to avoid them. Anticipating these consequences therefore has the potential to influence decision makers, particularly if they have not previously taken into account underlying and longer term health effects, and they are convinced that the best possible estimations are being presented to them.

### **3. Scoping – the boundaries of this assessment and the methods used**

To capture the full extent of the health consequences of violent conflict this assessment includes information on immediate, medium and long term health effects on levels of mortality and morbidity, on patterns of disease, public health infrastructure, nutrition, psychosocial and mental health, health systems and access to health care, the economic and social costs, and the environment. This is consistent with the widely recognised principles of HIA outlined by the European Office of the World Health Organisation known as the Gothenburg Principles (European Centre for Health Policy 1999).

Given the extensive literature from multiple sources on the health consequences of violent conflict, and the resources available to carry out this HIA, it takes the form of an extensive literature review, and advice from a range of key informants (see Expert Advisors list at end of document) from different specialities. It is planned to follow this up by a workshop to draw in some other key stakeholders.

Stakeholders include anyone who is likely to be affected by military action. However the primary focus of this HIA is the policy and decision makers – both civil and military - who have the power to make decisions on military action. We also hope to interest academics and others who might develop the use of HIA in situations of possible conflict in the future.

Initial searches focused on gathering information on the health effects of recent violent conflict similar to the scenario given here, in countries with broadly similar levels of economic status, population density and infrastructure, including water and sanitation and transport networks. There will inevitably be country specific influences on information and data, and in-country variations.

We have used a description of what informed sources indicate is the most likely military scenario should military action be taken, against which to assess health consequences. There are clearly different scenarios, which it is beyond the capacity of this HIA to consider. The situation would clearly change with the length of the conflict. Additional scenarios, the majority of which would cause even more devastating impacts on health, are mentioned where particularly relevant. An attack with nuclear weapons, which has been covered in detail by others (Physicians for Social Responsibility 2006) and which is considered less likely, is not included.

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Establishing a 'normal' baseline against which to compare changes to indicators is a challenge, particularly given the sanctions regime imposed on Iran that is already having a negative effect on health; where possible trends in indicators are included. The majority of indicators have multiple levels of ongoing impacts which are covered under each section.

To try to ensure the information is as accurate and balanced as possible recognised publishers and websites and known institutions and academics were used as sources, and where possible several sources were triangulated.

The health consequences of alternative courses of action that could be taken by decision makers involve different and extensive areas of expertise, such as foreign policy and intervention theory. It is beyond the scope of this HIA to include information on these, although they are touched on in the recommendations.

### **3a Likely military scenario**

This HIA is based on what is considered to be the most likely military scenario were military action taken against Iran. This scenario would of course change depending on how the situation developed, and health consequences would be very likely to escalate if the conflict is prolonged. It is beyond the scope of this HIA to cover all possible scenarios, however others are referred to where it is felt they are particularly relevant.

Military action against Iran would be most likely to target nuclear and missile facilities, including centrifuge cascades, with aerial strikes (Rogers 2010). These could come from military bases in the region and naval-aviation forces operating from aircraft carriers in the Arabian Sea (Rogers 2012). One objective would be to disable the uranium enrichment plants located in the vicinity of Natanz. There could also be a sustained attack on scientists and technical staff, through the bombing of research facilities such as physics, engineering, electronics and other subject related research laboratories and centres, in cities such as Tehran and Arak. Control systems, factories, manufacturing equipment and living quarters could also be targeted.

Other targets are likely to include military assets including air defences, radar and aerial command and control facilities, to reduce the possibility of immediate retaliation (Blair 2012). Iran's main military bases could also be a focus; this would include members of Iran's army, navy and air force, and the civilian and non-military services that are part of any military base. Facilities that could disrupt traffic through the Straits of Hormuz could also be targeted.

As Iran defended itself the situation would become more complex and escalation would lead to scenarios that are difficult to predict. The conflict may spread to Iran's neighbours in particular Iraq and Lebanon, and NATO may get involved with troops on the ground. Disruption to traffic through the Straits of Hormuz would be likely despite attempts to prevent this (Rogers 2006).

Many factories related to the support of the Iranian military that are likely to be targets are in, or close to, populated areas (Rogers 2006). Strikes on these facilities will have a high civilian cost, which is likely to be exacerbated by igniting flammable materials.

As already mentioned a nuclear strike is not considered in this assessment. At this time we judge an attack with conventional weapons to be more likely and a nuclear attack has been covered in detail by others (Physicians for Social Responsibility 2006).

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In summary the scenario considered is a prolonged air assault, using missiles and bombs with wide area effects, on military and supporting research and production facilities, including ones located in populated and built up areas, with severe consequences for surrounding areas and on infrastructure related to water, sanitation and transport.

#### **4. Appraisal of the evidence: identifying the health impacts**

Each of the following sections covers one indicator of the health consequences of potential military action, based on the likely military scenario described above. The indicators considered are:

- 4a Mortality
- 4b Injury
- 4c Patterns of Disease
- 4d Nutrition
- 4e Psychosocial and mental health
- 4f A breakdown in health care
- 4fi The pharmaceutical supply chain
- 4fii Delayed access to health care
- 4fiii Attacks on health facilities / health workers
- 4g The economic and social costs of conflict
- 4h Environment
- 4i Displaced people

Each section considers:

- an assessment of the likely outcome in the case of military action against Iran
- the present situation in Iran (where appropriate)
- what is known generally about the effects of conflict on this indicator
- examples of what has happened in other similar conflicts in countries with a similar infrastructure, economic level and population density.

The countries most frequently referenced are Iraq, Syria, the Occupied Palestinian Territories, Lebanon, Libya and Kosovo, and Iran in relation to previous conflicts.

The health consequences of previous conflicts, particularly the Iran-Iraq war, are included where they are thought to have a particular influence, including on the baseline against which to anticipate future changes. Although the Iran-Iraq war involved large numbers of ground troops and so was very different to the scenario presented here, it is a terrible reminder of what can happen when conflict escalates, and still has devastating consequences for many Iranians today (Salamati 2013).

##### **4a Mortality**

Mortality rates in Iran, relatively low for the region, would rise significantly in the event of military action, not just from the direct causes of war but also from an increase in communicable disease, difficulties in treating non-communicable diseases, and as a result of injuries. One of the dangers of attempting to make the best estimation possible is that underestimation is likely. It is also possible that mortality related to disease is already affected by the current international economic sanctions against Iran, which have prevented Iranian citizens from accessing necessary medication. Mortality is highly likely to continue increasing the longer conflict continues.

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In 2011, the adult (15-60 years) mortality rate in Iran was 154 per 1000 for males and 85 per 1000 for females with an under-5 mortality rate of 25 per 1000 live births and an infant mortality rate of 21. Life expectancy at birth for both sexes was 73 years-72 years and 75 years for men and women respectively (WHO 2013a). Age standardised mortality rates in 2008 were 82 per 100,000 population for communicable disease, 599 for non-communicable disease and 90 for injuries (WHO 2013a). These figures would deteriorate dramatically with the onset of military action.

The level of excess mortality due to conflict will be influenced by many factors and while there has been significant recent work on the collection of mortality figures during and after conflict, producing accurate figures can still be a challenge. Data may be unreliable because of a lack of, or disruption to, both a centralised registration system for births and deaths and the health information system; there may be confusion as to the definition of a civilian; different methodologies may be used for data collection, although with triangulation this can also improve estimates; authorities can “distort or conceal” numbers (Roberts 2010); and reported data may reflect a vested interest in over or underreporting.

Partly because of those difficulties figures are often the subject of dispute. There is also uncertainty about some global assumptions: although it is generally agreed that civilians often suffer a greater burden of conflict related deaths and injuries, claims that 90% of war victims are civilians have been shown to be erroneous (Roberts 2010) and can make more evidence based estimations appear less credible.

In the conflict between Israel and the Occupied Palestinian Territories between 2000 and 2008 it has been estimated that there were 4700 direct deaths due to military action, of which most were civilian (Batniji 2009). Between Dec 27 2008 and Jan 17 2009 during Operation Cast Lead, the Israeli offensive on Gaza, one source estimates that 1366 Palestinians were killed (ibid), while the UN estimates that 1417 Palestinians were killed and more than 5380 were injured (UNDP 2010). Though there is a slight difference in the mortality figures, their proximity gives confidence that they are in the right range.

The death toll of civilians resulting from the recent war in Iraq is contested, has used different methodologies and covers different time periods. It ranges from 124,000 in the period 2003-2013 using data collected from media sources (Iraq Body Count 2013) to 654,965 excess deaths in the period 2003-2006 using a cross-sectional random cluster sample survey (Burnham 2006). The Iraq Body Count says it may add 11,000 civilian deaths following further analysis of the Wikileaks War Logs. A recent mortality survey covered the period 2003-2011, and found that the crude (all cause) mortality rate in Iraq was 0.5 times higher during this period than during the 20 month period prior to the 2003 invasion (Hagopian 2013).

When NATO intervened in Libya in March 2011 excess deaths from UN estimates were in the region of 1000-2000 (Milne 2011). The Ministry of Health of the former Libyan Government said that 6,121 civilians had been killed by NATO air strikes between March 19<sup>th</sup> and the end of June 2011 (Lamb 2011). By October 2011 the National Transitional Council estimated 30,000 dead overall. Detailed follow up showed that air strikes had killed dozens of civilians in specific instances (New York Times 2011; Amnesty international 2012). An accurate figure is almost impossible to come by and there is no proactive collection of data in Libya as there was in Iraq.

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In 2012 it was estimated that globally 87% of those killed and injured from air launched explosive weapons in populated areas were civilians<sup>1</sup>. Syria was thought to be the country that suffered most from explosive violence in 2012, and while ongoing violence made detailed reporting impossible, 58% of global casualties from air launched explosive weapons were estimated to be in Syria (Dodd & Perkins, 2013).

#### **4b Injury**

Estimating the number of injuries that result from conflict is challenging, and how many injuries go on to become part of mortality data is difficult to know. However all the evidence below indicates that any military action against Iran would increase the incidence of injuries significantly.

In addition to the direct injuries from explosions and attacks during conflict, there are many more indirect injuries. Direct injuries include those from firearms and landmines (Zargar 2007), bombs and bullets (Costs of War 2013a), artillery shells, improvised explosive devices, mortars and rockets (Smith 2011). 9% of all casualties (dead or injured) recorded in 2012 by Action on Armed Violence (AOAV) globally were from air launched explosives; the number of civilian casualties from air launched explosive weapons rose to 87% when they were used in populated areas (Dodd and Perkins 2013).

Indirect injuries can be caused by fires started by bombs (Costs of War 2013a), poisoning, electrocution and an increase in road accidents which can occur because of a breakdown in infrastructure (Donaldson 2010) and an increase in stress levels. Exposed electrical wires can cause electrocution and an unstable supply of electricity and lead people to seek alternative fuels for cooking which can cause unintended explosions. There have been cases reported in Iraq of kerosene being stored in unmarked water bottles and being drunk by unsuspecting people (Donaldson 2010).

It has been suggested that the increase in fatal road accidents in Iraq can be attributed to the conditions of the roads and the deregulation of cars which has been exacerbated by the conflict (Ismael, in draft). Iran already has a rate of road accidents 20 times the global average, which a major national programme is trying to address (UNICEF 2013a). Conflict would disrupt this programme and is likely to worsen the condition of the roads and the ability to maintain vehicles.

Bombs which fail to explode on impact can detonate weeks or months later, killing or injuring many and creating the need for future long-term care and prostheses for survivors. During conflict, those who have been disabled will frequently struggle to access adequate rehabilitation treatment and equipment (UNDP 2010). Civilians and military personnel may be permanently disabled, or disabled for long periods, needing costly long-term health care for many years to come (Bilmes 2011; Zargar 2007).

Between 12 and 16 million landmines were planted in Iran during the Iran-Iraq war (1980-1988), contaminating approximately 42,000 km<sup>2</sup> of land, mainly in the five western provinces of Iran. By 2003 this area had been reduced to 24,000km<sup>2</sup>, and in one year ending in 2005 252,383 antipersonnel mines, 37,522 anti-vehicle mines and 1,478,508 items of unexploded ordnance (UXOs) were found and destroyed (International Campaign to Ban Landmines 2005). Between 1988 and 2003 a total of 1499 people underwent surgery to amputate a limb(s) due to landmines and UXOs

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<sup>1</sup> In this source casualties were recorded as 'civilian' if they had not been recorded as being part of the state military, members of non-state armed groups, or security personnel considered likely to be armed, including police, security guards, intelligence officers and paramilitary forces.



(Soroush 2008). As well as casualties their presence has hindered socio-economic development including mining, made arable and grazing land unusable, and prevented access to some services.

Blasts from explosives cause far greater damage to children's more delicate and smaller bodies, whose vital organs are closer to the ground. Children's injuries also tend to be more difficult to treat. During 2012 a 45% rise over the previous year was recorded by AOAV in the number of children killed and injured from explosive weapons globally; this made up 5% of the total civilians recorded as killed and injured during the same period (Dodd and Perkins 2013). Physical disabilities sustained included loss of sight, hearing, limbs, and contractures from burns and spinal cord injuries. The recovery process is often long and further complicated by the fact that the children are still developing and growing.

#### ***4c Patterns of Disease***

As detailed below the incidence of many communicable diseases in Iran has fallen over recent decades; any military action will slow, and in the worse case reverse, this positive trend.

Suffering ill health during a period of conflict is highly likely to place an extra burden on individuals and their carers and make it harder to treat and care for them than during peace-time. Both communicable and non-communicable diseases create challenges. Outbreaks of communicable diseases are likely to occur because of the circumstances created by conflict. In contrast, chronic diseases tend to be exacerbated and more difficult to treat because of reduced access to healthcare and because communicable diseases - particularly the prevention and mitigation of epidemics - tend to be prioritised during emergencies.

The transmission of communicable diseases is highly likely to increase during conflict, both due to a breakdown in public health programmes and health services, and to environmental and living conditions. Health services are frequently disrupted, medical supplies be severely reduced, and health staff often have to flee. Living conditions are often overcrowded with poor water and sanitation, and resources for daily living drastically reduced. Surveillance and other public health measures may break down making outbreaks more likely (see 4f). Populations may be particularly vulnerable to infection because of malnutrition and low vaccine coverage (Gayer 2007). Specific environmental issues such as carcinogenic substances in the soil from munitions are associated with specific health problems (see 4h).

The incidence of many communicable diseases has fallen significantly in Iran over recent decades (Askarian 2012). In 2004 28% of years of life lost were due to communicable disease (as a proportion of WHO broader causes: communicable diseases/ non-communicable diseases/injuries) as opposed to a 55% regional average (WHO 2009). The incidence of tuberculosis in Iran in 2011 was 21 cases per 100,000 people (WHO 2013a), compared to a regional incidence of approximately 112 per 100,000 people (WHO 2012b). Significant progress has been made in controlling vaccine preventable diseases, with the Expanded Program of Immunization being implemented through the primary health care system. Coverage for all vaccines was estimated by WHO-UNICEF to be over 95% (herd immunity) in 2012 (WHO 2013c).

Chronic diseases already accounted for 70% of all deaths in Iran in 2002. Cancer, cardiovascular disease, diabetes and chronic respiratory conditions caused an age-standardised adult mortality rate of 405 in those aged 30-70 years per 100,000 population compared to a regional rate of 517 (WHO 2013a).

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As a developed country with a high standard of healthcare and an ageing population, there are large numbers of people being treated for chronic diseases in Iran. These patients suffer from diseases such as cancer, kidney failure, diabetes, haemophilia, and multiple sclerosis (Mowafi 2011; Dehghan 2013). Their management is dependent on regular access to medicine and expensive equipment for procedures such as dialysis and chemotherapy. Reports from Iran suggest that those suffering from chronic diseases are already severely affected by medicine shortages due to international sanctions, a situation which would be further exacerbated by conflict (Dehghan 2013; Borger and Dehghan 2013).

In Iraq after the invasion in 2003, those with chronic diseases suffered more because of the high cost of treatment, uneven distribution of services and lack of access to healthcare and medicines. People found it very difficult to manage their conditions and a hierarchy of access was created as poorer people had to struggle hardest to find medication (Medact 2004). A low level of immunisation meant that Iraqi children became susceptible to vaccine preventable diseases (see 4f). Reduced access to primary care meant treatment started late increasing the risk of outbreaks, for example of diarrhoeal disease (Mowafi 2011).

Overcrowding and poverty increases the risk of exposure to TB (Singer 2003). In Tajikistan, and post-war Kosovo there have been instances of the reintroduction of previously eliminated infectious diseases, such as malaria and tularaemia, because of unsanitary environmental conditions (Gayer 2007).

There is a growing body of research resulting from concern about increased reported cases of birth defects and leukaemia following and during the conflict in Iraq (see also 4h). Collaborative research between the University of Washington and the University of Basra found that childhood leukaemia rates more than doubled in Basra during the 15 years from 1993 to 2007 (Hagopian 2010).

Frequently expressed concern on the part of health professionals about an increase in the cases of birth defects seen in health facilities in Fallujah have been repeatedly raised (Busby 2010). A recent survey carried out by the Iraqi Ministry of Health and WHO found a three-fold increase in reported birth defects between 1988—92 (7.6 per 1000 births) and 2003—07 (26.2 per 1000 births). The report nevertheless concluded that “The rates for spontaneous abortion, stillbirths and congenital birth effects found in the study are consistent with or even lower than international estimates” although with regional variations (Iraqi Ministry of Health 2013). Discussions about the findings of this study are ongoing.

There is some evidence that the effects of Post Traumatic Stress Disorder (PTSD) and reduced cortisol levels that occur with prolonged exposure to traumatic circumstances such as those related to conflict, can also increase people’s susceptibility to conditions such as cardiovascular disease and insulin resistance (Pace 2011). They can make people more at risk of developing metabolic syndrome, rheumatoid arthritis, psoriasis and thyroid problems which may produce symptoms many years later (ibid). Research indicates a potential link between the psychological distress associated with conflict and physiological changes such as hormonal imbalances and changes to the immune system resulting in physical disease, particularly in the case of immune-mediated or inflammatory disorders such as asthma (Wright 2010).

#### **4d Nutrition**

As described below, the nutrition of children under 5 years old in Iran has significantly improved over the last decades. The multiple negative effects on food security that would be caused by

military action, including disruption to markets and agriculture production, and displacement of people away from their livelihoods, would be damaging to this positive picture. There could be many consequences including for education and child development.

Conflict can severely affect people's ability to access food. Food insecurity and resulting poor nutrition will contribute to an increase in infant, child and maternal morbidity and mortality in particular. It will make other vulnerable groups, such as the elderly and the disabled, more susceptible to communicable diseases. For children, the effects of malnutrition can outlive the conflict, affecting their physical and cognitive development far into later life.

The statistics on child nutrition show good long terms trends in Iran. The percentage of children under 5 years old who were underweight reduced from 13.8% in 1995 to 4.6% in 2004; who were stunted reduced from 24.4% in 1995 to 7.1% in 2004; or who were wasted, reduced from 8.1% in 1995 to 4.8% in 2004 (WHO 2012a). 7% of babies had a low birth weight according to the most recent data (between 2007-2011) (UNICEF 2013c).

Chronic malnutrition in children leads to long term health consequences such as 'impaired cognitive and skeletal development, increased frequency of obesity and chronic diseases in later life' (Matthew 2011). Poor nutrition also increases vulnerability to - and mortality from - communicable diseases such as influenza, and mortality from measles increases significantly (WHO 2013c). Poor nutrition during a child's formative years creates a susceptibility to ischaemic heart disease later in life (Singer 2003) as well as cognitive deficits in adulthood (RAND 2007). In the case of malnourished adults, Cocksackie B3, normally a harmless virus, can produce life-threatening heart disease (Singer 2003).

Food insecurity can occur because of damage to crops and agricultural equipment from air-strikes, or by making the area unsafe for cultivation. This severely damages household, local and eventually national economies, making food production for own consumption and trade difficult or impossible. International sanctions or policed borders can also block or deter people from importing food, and is particularly damaging if the country is heavily dependent on food imports as has been seen in Gaza and Syria. Displaced people are at risk of malnutrition as they are removed from their normal support structures and may be living in overcrowded and under resourced conditions.

26% of children under 5 years old in Iraq were stunted due to malnutrition in 2009, with 6% underweight and 6% wasted (UNICEF 2013b) and 15% of Iraqi babies were born with low birth weight according to the most recent data (between 2007 and 2011) (UNICEF 2013d). Iraqi infant mortality rates increased 150% between 1990 and 2005 (Costs of War 2013b) a period covering the two Gulf Wars. This period also included almost thirteen years of international sanctions which created shortages which negatively affected the health of children (Wallenstein 2004), and left the population more vulnerable to the shocks of the second Gulf War.

In the aftermath of the Iraq war, many families living in refugee camps did not have their food ration cards with them and therefore could not access systems of government food support (Webster 2009b). Even if food is available, loss of income can mean an inability to buy food. Many households in the West Bank and Gaza Strip fall into the Palestinian Bureau of Statistics' classification of 'deep impoverishment', as more than 44% of their expenditure is on food. In 2009 the World Food Programme estimated many households in the West Bank and Gaza spent 49% and 56% respectively on food (Matthew 2011).

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#### ***4e Psychosocial and mental health***

A substantial amount of research has shown the psychological effects of conflict. Post-traumatic stress disorder (PTSD), anxiety, depression and sleep disturbances are some of the most commonly reported psychiatric disorders (Murthy 2006; Levy 2013; UNDP 2010; Thabet 2011; Webster 2011; Montgomery 2011; Smith 2011). Attention has also been drawn to the need to engage in processes of remembrance, recognition and accountability as part of recovery and psychological wellbeing (Behrouzan 2013a).

Iranian citizens are still recovering from the devastating impact of the Iran-Iraq war, including the effects of chemical weapons (Falahati 2010). The Iraqi invasion of Kuwait and the subsequent oil fires had negative consequences for the mental health of Iranian citizens living in bordering provinces (Ministry of Health Iran 2003). The invasion created new stressful experiences but also reawakened previous traumas in a population that had previously experienced the Iraq-Iran war. Any military action can be expected to both reverse recovery from these experiences and reignite previous traumas, as well as introducing anew the well documented psychosocial and mental health consequences of conflict detailed below. If the attack against Iran became a ground incursion then outcomes for civilians would be considerably worse.

Two approaches have been developed to explain the relationship between trauma and conflict: the trauma-focused approach and the psychosocial approach. The trauma approach focuses on the effects of direct exposure to violence such as physical assault, destruction of one's home or experiencing the death of parents, siblings, friends or neighbours. Other examples of direct exposure include children having to hide underneath the body of a dead person or being forced to commit an act of violence in order to survive (Muller 2013).

The psychosocial approach focuses on social and material conditions and the more indirect results of conflict including poverty, malnutrition, displacement, overcrowding, and loss of social networks. These conditions create daily stressors which can have a severe negative impact on mental health (Panter-Brick 2008). Continual daily stressors may reduce people's coping mechanisms, and sense of control over their lives, wearing down their ability to cope effectively with past traumas and consequently exacerbating their PTSD. They can also make individuals more vulnerable to other physical and emotional illnesses (Miller 2010) and there are suggested links between conflict induced psychological trauma and physical health (Wright 2010). One of these is a model which explains the connection between the neurobiology of stress and asthma. Psychological stressors disrupt the stress regulatory system, which leads to changes in nervous and immune responses potentially causing disorders such as asthma (Miller 2010). This theory is supported by the finding that war-related stressors and increased risk of asthma has been observed in elderly Kuwaiti civilians living during the 1990 Iraqi invasion (see 4h).

Iranian society is still recovering from the devastating impact of the 8 year long Iran-Iraq war. Anxiety disorders (8.35%) and mood disorders (4.29%) in Iran are among the highest diagnosed psychiatric disorders (Mohammadi 2005). Overall medication rates are on the rise for mental health problems (Behrouzan 2010). Research has documented the numerous social problems such as the rise in drug use, suicide rates, and psychiatric disorders among a generation who grew up during the Iran-Iraq war (Behrouzan 2010). The lifetime prevalence rate is 14% for suicide ideation, 6.6% for planning and 4.1% for attempts (Shooshtary 2008).

Research suggests a connection between exposure to chemical weapons and psychological trauma.

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60,000 civilians continue to experience psychological and physical problems as a result of the indiscriminate use of chemical weapons against the Iranian population during the Iran-Iraq war (Behrouzan 2013b). One study investigated prevalent rates of PTSD among the children of chemical warfare survivors. 5.5% of this group of children was found to have severe levels of PTSD, 93% had moderate levels in comparison to 2% and 70% respectively among the children whose parents had not been subject to a chemical attack (Ahmadi 2010).

In addition to these burdens, there is a lack of resources to treat mental health patients already in Iran. For every 100,000 Iranians, there are 1.9 psychiatrists, 0.5 mental health nurses, 2.0 psychologists and 6.0 social workers (Mohammadi 2005). WHO recommends an absolute increase of 65 psychiatrists and 3633 mental health nurses is needed (Bruckner 2011). The disruption to services – including personnel – that would be caused by conflict would result in prolonged delays to treating those afflicted, and leave those affected suffering and incapacitated.

Three different studies were carried out on Iraqi children in 2006 (Razokhi 2006). The first examined 600 primary school children. 47% of these children had been exposed to a traumatic event in the previous two years. Subsequently, 14% of this group were diagnosed with Post Traumatic Stress Disorder (PTSD). The second study investigated the prevalence of psychiatric disorders in 1090 adolescents, 30% of whom had symptoms of PTSD. The final study looked at mental health in working street children and school children. 36% of the former group had a mental disorder in comparison to 13% in the latter group.

A study carried out in 2010 investigated mental health in children and adolescents who attended the child psychiatric clinic in Baghdad (Al-Obaidi 2010a). They found anxiety states were the most common at 22.1%. The mental health situation in Iraq was exacerbated by the lack of separate in-patient mental health services for children and adolescents. Amongst the 100 psychiatrists in Iraq, none of them were formally trained in children and adolescent mental health. Care can be complicated by a continuing stigma around mental health. All of these disparate factors mean that children and adolescents find it more difficult to receive the appropriate care needed for them to make a full recovery (Al-Obaidi 2010b).

A survey carried out in the Occupied Palestinian Territories in 2009 after Operation Cast Lead, found that 91.4% of children showed signs of moderate to severe PTSD, with only 1.3% of children showing no signs of PTSD at all (UNDP 2010).

#### ***4f A breakdown in health care***

A military attack on Iran would inevitably have a negative impact on its health care system, increasing demand, reducing resources and making access for patients and staff difficult and risky in some areas. This would contribute to increases in mortality and morbidity. Adequate treatment may not be available for the sick and injured who may not be able to access what treatment there is because of damage to roads and/or insecurity, and health systems may be overwhelmed by the increased need created by conflict.

Health workers invariably face increased workloads, reduced resources and often threats to their own safety during conflict. Many who want to stay and work may flee because of threats to themselves and/or for the security of their families (see Section 4fiii). In 2005 in Iran there were 8.9 physicians, 14.1 nursing and midwifery personnel and 2.0 pharmacists and 17 hospital beds per 10,000 of population. These figures are somewhat below the regional averages of 10.8, 15.9, 5.2

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and 12 respectively (WHO 2013a). Despite this there have been positive outcomes; for example Iran is one of the countries who has already achieved Millennium Development Goal 5: reducing the maternal mortality ratio by 75% between 1990 and 2015. This was achieved by 2010 with a reduction of 81% (WHO 2012c). However the disruption to the health system that conflict would cause would inevitably jeopardise these gains.

The significant funds governments spend on military equipment and personnel in preparation for and during war can divert funds from public healthcare (Iqbal 2006; Iqbal 2010). A smaller health budget can also lead to less stringent governmental regulation of public health hazards, including cuts to government inspectors and less regulation with the potential for contaminated food products and bacterial infection. Bacterial infection could then be a factor in causing communicable disease related deaths to rise (Li 2005). Conflict frequently disrupts the supply chain for pharmaceutical and other resources making it difficult to control communicable diseases and manage chronic conditions (see 4c & 4fi). Iranian government expenditure on health as a percentage of total government expenditure rose from 8.4% in 2000 to 10.1 in 2010 and is higher than the regional average (WHO 2013a). Conflict would inevitably challenge this positive level and direction.

The Iranian primary healthcare system (PCH) was established in 1981 as a response to the global goal of 'health for all by 2000'. The objective was to improve a range of public health indices, including infant and maternal mortality rates and vaccine coverage. In addition, it aimed to provide community health in rural areas, focus on preventative rather than curative care and put an emphasis on a community-centred approach to the planning, implementation and evaluation of healthcare (Asadi-Lari 2004; Lankarani 2013). Approximately 16,000 health houses provide healthcare for over 90% of Iran's 23 million rural population (WHO 2008b), referring as necessary to the rural health centres which make up the next level of the system. In urban settings there are 2,300 urban health centres each serving a population of approximately 15,000 people. Iran's PHC system has been described as highly organised and efficient. There has been a radical decrease in the number of infant, maternal and neonatal deaths and an increase in life expectancy since it was established.

Military action against Iran is bound to negatively affect this progress. Conflict has had devastating long term effects on health systems in countries which have suffered airborne attacks, which have continued long into the post-conflict period. Eight years after the invasion of Iraq, its healthcare system is severely weakened, partly because of an exodus of highly qualified professionals. Five years after the occupation in 2003, an estimated 75% of doctors, pharmacists and nurses had left their jobs, and over half of them had left the country (ICRC 2007; IRIN 2007b, IRIN 2007c; Medact 2008.) Consequently, 40% of the country's primary healthcare clinics have insufficient doctors. In 2009, the Iraqi government estimated that 628 doctors had been murdered (UPI 2011), but the Iraqi Medical Association believed the figure was closer to 2000 (Zarocostas 2007). 90% of the 180 hospitals in the country are insufficiently equipped, inevitably limiting the ability to treat normally preventable conditions (Tarnoff 2008).

This must be one of the factors behind Iraq's worsening health indicators. Life expectancy in 2010 was 58 years, down from 65 years in 1980. Maternal mortality rates in 2010 were twice as high as those in Jordan, at 84 deaths per 100,000 live births. Immunisation coverage of infants with DPT3 (diphtheria, pertussis and tetanus), OPV3 (polio), and measles vaccinations dropped to 78% in 2006 from 84% in 2005. Between 2004 and 2007 only 48% of displaced Iraqi children were found to have been immunised with DPT3, OPV3 and measles vaccinations (UNOCHA 2007). Such low levels of

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immunisation can threaten not only the health of the affected population but also those with whom they come into contact. In 2007 35% of pregnant women were anaemic, and approximately two thirds of children under 5 years old died as a result of diarrhoea and respiratory infections (UN 2013; UNOCHA 2007).

Strains on health services and facilities have been reported in other Middle Eastern conflict zones. In Gaza, following the Israeli attack in November 2012, one hospital saw a 20% increase in patient numbers. The shortage of medicines compelled people to buy their own from special pharmacies when they could although they may often have been too expensive (Al-Ghoul 2013). There is also a shortage of psychiatric doctors. In Syria and Iraq, a breakdown in security resulted in the looting of hospitals (Medact 2004; McDonnell 2013).

The damage to surveillance systems during conflict results in delays to the detection and recording of epidemics (Gayer 2007). Other factors which contribute to a lack of investigation, identification and implementation of control mechanisms include inadequate laboratory facilities and expertise in specimen collection, inability to access affected populations due to fighting, damage to roads and transportation, poorly trained staff and failure of the delivery of drugs because of logistical and cold chain problems. The failure to prevent and control epidemics – likely in conflict environments - could increase the likelihood of pathogens emerging that are resistant to available drugs. The effective management of emerging infectious diseases needs an efficient healthcare system that has the satisfactory medical equipment, experts, and medicines – all the things that are unlikely to exist during a conflict.

#### ***4fi Pharmaceutical supply chain***

A major health consequence of violent conflict is the disruption to the pharmaceutical supply chain, resulting in many people being unable to access sometimes life-saving medicines. In Iran the sanctions have already weakened the supply chain. Iranians suffering from chronic diseases such as haemophilia, cancer, and multiple sclerosis are finding it increasingly difficult to obtain vital drugs, and operating theatres have begun to run out of anaesthetics (Sahimi 2012; Borger 2013). While the sanctions regime in theory exempts medicines and other items concerned with health, in practice its prohibition of money transactions results in it being impossible for the Iranian Ministry of Health and others to import medicines and components for their manufacture (Namazi 2013).

The incidence of communicable diseases can increase significantly during conflict, and public health controls normally used to prevent epidemics break down (see 4c). Disruption to the pharmaceutical supply and to the cold chain exacerbates this situation, as they mean appropriate vaccination campaigns and public health measures to prevent and control outbreaks cannot be undertaken (Gayer 2007). In Syria, the average vaccination coverage was 81.5% for all vaccines between the years 2008-2011. This fell to 70% in 2012. Insecurity has made it difficult to maintain the cold chain and supply vaccines (WHO 2013c).

Damage to infrastructure including electricity, fuel and water systems can have terrible consequences for health systems (Batniji 2009; Costs of War 2013c; Mowafi 2011; Kisswani 2013). Since the start of the conflict in Syria in 2011, it is estimated that a third of hospitals have been destroyed, while more than half have been damaged. Damage to roads and vehicles have also made the transport of pharmaceutical supplies more difficult and contributed to the shortage of medicine (Burki 2013). Local production of medicine has dropped by 90%. There is a lack of qualified staff particularly in trauma, anaesthesia, and of specialized laboratory personnel, and in areas where

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there is intense fighting this shortage is more acute. Anaesthetics, analgesia, antibiotics and intravenous fluids are also in short supply (WHO 2013d).

#### ***4fii Delayed access to care***

People may be intentionally prevented from accessing services during conflict; more frequently access can be delayed because of a shortage of medical staff, curfews and the risks involved in reaching clinics or hospitals, or their closure because of insecurity. This has a detrimental effect on all people seeking immediate care and can create emergencies out of normally treatable conditions, for example in the case of obstructed labour. Military action against Iran would make it difficult for people to access health care.

Reproductive care is particularly sensitive to delayed access. Reproductive care in Iran is currently of a high standard. Between 1990 and 2010 the maternal mortality rate fell from 120 to 21 per 100,000 live births (WHO 2013b) and antenatal care coverage was good: between 2005 and 2012 98% of all women were visited at least once and 94% of women were visited at least four times. The percentage of neonates protected at birth from tetanus rose from 82% in 2002 to 95% in 2010 (WHO 2013a). 97% of births were attended by skilled health personnel in 2005 (the last year for which information is available) (WHO 2013a).

Care can also be delayed because of high demand and inadequate medical supplies. In Iraq there were still staff shortages in 2008-9, with doctors having to treat 7.5 patients per hour in emergency departments, patients who often had severe trauma (Donaldson 2012). After the invasion in 2003, medical supplies for cancer patients – already affected by sanctions – were further disrupted, and in 2011 these supplies were still inadequate and under resourced (Al-Hadad 2011).

In Syria in 2013 there was a shortage of qualified staff, particularly of trauma, anaesthesia and specialized laboratory personnel, and in areas of intense fighting (WHO 2013d). In the Occupied Palestinian Territories, Palestinians have suffered secondary complications such as ‘infected wounds, contractures, or secondary amputations’ as a result of difficulty in accessing appropriate initial medical care (UNDP 2010). Hospitals, ambulances and primary health care centres have been damaged in attacks, causing delays in treatment which can mean the patient’s condition deteriorates and an increase in mental suffering associated with this is likely (Al-Ghoul 2013).

A lack of access to antenatal care, emergency obstetric care, clean water and adequate nutrition contributes to increased maternal mortality rates. As in Iran, prior to the conflict, Syria had a well functioning system of antenatal care and obstetric care (CBC 2013; Kisswani 2013). The effect of the conflict has been to side-line reproductive health in favour of treating emergency injuries, leading to a deterioration in obstetric care and potentially a lack of surgery or medical attention for dealing with complications. Some reports describe women giving birth in field hospitals next to people dying of bullet wounds (Jaeger 2013).

In Gaza, restrictions on mobility can add a waiting time of up to 4 hours before women in labour can be attended to (Matthew 2011). During the Iraq war, many pregnant women were unable to reach hospitals at all (UNIFEM 2007) and reproductive health suffered enormously; leading to increases in maternal and infant mortality rates (Medact 2004). Low birth weight and congenital abnormalities are now the biggest causes of infant mortality, and low birth weight in particular is influenced by a lack of suitable antenatal care (Matthew 2011). Women living in conflict areas or refugee camps are likely to experience disruption to basic sexual and reproductive health services (Cottingham 2008)

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and frequently lack access to family planning services which may increase the likelihood of an unwanted pregnancy.

#### ***4fiii Attacks on health workers and health facilities***

Attacks on healthcare facilities, healthcare workers and medical vehicles, despite being prohibited under international humanitarian law, can be common in some conflict situations (UNDP 2010; ICRC 2011a; Rubenstein 2010). Damage can be caused by accident or intentionally for a range of motives, including to deprive enemies of medical assistance, terrorise the local population, rescue wounded comrades, or for a variety of political, religious or ethnic motives (ICRC 2011a).

In Libya, in May 2011, three ambulances were hit in three separate incidents (ICRC 2011b). In Lebanon, during the 2006 conflict two ambulances came under attack on two separate occasions (The Guardian 2006). Similar situations have also occurred in Columbia, the Occupied Palestinian Territories, Afghanistan and Nepal. Any targeting of health workers denies care to those in need. In Fallujah in Iraq in 2004 US forces occupied Fallujah's General Hospital and denied access to the city including by the Red Cross and Red Crescent (Turlan 2006).

Sometimes it is unclear whether attacks on health facilities and health workers are collateral damage from, for example, missiles and mortars, or intentional. In 1999, during the NATO campaign in Serbia, there were two attacks on convoys carrying refugees fleeing Western Kosovo. NATO claimed they had been hunting Yugoslav units responsible for burning villages. Consequently, NATO was unable to verify what happened on that day (BBC 1999). In Libya, Sri Lanka, Somalia, the Occupied Palestinian Territories, Lebanon, Yemen and Rwanda, there has been serious damage to health facilities which has been claimed to be unintentional (ICRC 2011a).

Whether intentional or not such attacks deny care at a time of increased need, and put patients and health staff in physical danger. They compound the stress that patients are anyway under due to being sick or injured and away from home. They also increase stress levels for staff often working with inadequate resources and an increased workload, and frustrated by not being able to meet their normal standards of practice.

#### ***4g The economic and social costs of conflict***

Iran has the second largest economy in the Middle East and North Africa. GDP was estimated at \$484 billion in 2012 (World Bank 2013). Military action against Iran would be detrimental to an economy already weakened by sanctions (New York Times 2013), with severe knock on effects for health. Research has identified the multiple economic costs of conflict. Individual economic costs include loss of a household breadwinner, having to care and provide medicine to disabled family members and paying for funeral costs. Damage to national economies can result in reduced investment in infrastructure, increased unemployment, and a decrease in trade, just some of the multiple factors which will also be damaging to health.

The cost of damage caused by Operation Cast Lead, Israel's assault on Gaza between December 2008 and January 2009 has been estimated at US\$ 659.3 million, 84% of which was for damage to housing, agriculture and business (EUNIDA 2009). In Lebanon, during the July-August 2006 conflict, 3,897 hectares of land was contaminated by cluster munitions. 2,596 of this was agricultural land (Landmine Action 2008). The resulting economic loss has been estimated to be between US\$33 million and US\$122 million. The loss of agricultural production, and the death, injury and disability caused, has added to the poverty in what was already considered to be one of the poorest regions in

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Lebanon. Despite the significant funds allocated to post-conflict clearance it is unlikely that southern Lebanon will be free of cluster munitions for many years.

Conflict derails a country's effort to develop and build its economy, just one example being the Iran-Iraq war which had a devastating impact on the Iranian economy. After the revolution Iran had planned to introduce new policies to restructure its economy. There were plans to reduce Iran's dependency on oil revenues, diversify the economy, increase non-oil exports, reduce dependency on trade with the West and make agriculture the axis of development. Two years before the start of the Iran-Iraq war spending on the military had reduced; however this increased following the Iraqi invasion and economic reforms had to be put on hold. The economy became more dependent on oil production/export revenues (Morfid 1990). The total economic cost of the war to Iran and Iraq is estimated to be \$637 billion and \$376 million respectively.

Iraq experienced less structural damage during the Iran-Iraq war. Nevertheless, Iraq's foreign debt to western creditors at the end of the war was estimated at \$35 billion. The Iran-Iraq war also had a global impact, through high energy prices and a greater sense of insecurity. The global economic cost of the Iran-Iraq war is estimated at \$1.4 trillion (Askari 2013). It is impossible to put a price on the social impacts of this conflict which include over 144,000 orphaned children (Zargar 2007).

Conflict and war have multiple social costs of which only a few are mentioned here. Across the globe, children with physical disabilities sustained from explosive devices are more vulnerable to poverty, and possible abuse and exploitation. 25% of injured people managed by Handicap International in Syria are under the age of 12 (UNICEF 2013e). Disabled girls are less likely to be considered marriageable and boys could be perceived as failures if they have to struggle to fulfill their role as breadwinner. Disabled children are also more likely to drop out of school, experience social exclusion and have a diminished opportunity to earn a living when older. Explosive weapons destroy schools and make it dangerous for both teachers and children to get to school (Smith 2011). An estimated 2,400 schools have been damaged by the conflict in Syria. On the days when schools are open, attendance is down to two days a week. Thousands of schools have also been used as shelters for civilians (Brown 2013).

Iran has good social indicators. The government has increased expenditure for education and health, and the number of children enrolled in primary schools has increased from 66% in 1995 to 84% in 2009. Youth literacy rates have increased from 77% in 1995 to 99% in 2009 (World Bank 2013). Per capita government expenditure on health increased from \$127 to \$320 between 2000 and 2010 (purchasing power parity) (WHO 2013a). Nonetheless conflict, particularly if it became prolonged, would almost certainly set back the gains made in all of these areas, as spending on education and health would be redirected to military efforts, as happened during the Iran-Iraq war.

Some social costs are impossible to quantify but are nevertheless very real. The Iran-Iraq war and the involvement of other countries in supporting Iraq, including the devastating use of chemical weapons, are relatively recent occurrences. The collective memory of injustices from that time, already aggravated by the present sanctions regime, would be compounded by a further attack on the country by outside forces (personal communication).

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#### **4h Environment**

Many conflicts generate a ripple effect on the environment. The weapons it is anticipated would be used in an attack on Iran (see 3a) would cause extensive damage to the environment. The examples given below from other conflicts within the region show that this can lead to poverty and food insecurity, and can cause physiological and psychological damage to individuals, in both the immediate and long-term.

Limiting a country's ability to produce food leads to food insecurity with possible dire consequences for nutrition, particularly of vulnerable groups (see 4d). Israeli strikes on Gaza in 2008-2009 damaged or made inaccessible 46% of agricultural land and thousands of cattle, sheep and chickens were killed leading to food insecurity (UNDP 2010). Malnutrition makes people, and children especially, more vulnerable to disease, including influenza, tuberculosis and Coxsackie B3 in the short term and heart disease later in life (See 4c).

Damage to the public health infrastructure in Iraq, including water purification and sanitation systems, led to numerous outbreaks of waterborne diseases such as cholera between the years 2007-2008 (IRIN 2007a; Mowafi 2011). The incidence of water borne diseases such as gastro-enteritis, hepatitis and typhoid fever all increased, almost certainly due to contaminated drinking water. The UN has documented the disposal of millions of litres of untreated sewage in the sea surrounding the Gaza Strip (Batniji 2009). In Iraq and Gaza, there have been outbreaks of cholera (Mowafi 2011) and an increased incidence of diarrhoea due to untreated sewage and unclean water (Medact 2004; IRIN 2007a; Webster 2009a; UNDP 2010; Mowafi 2011) (see also 4c).

The long-term implications of environmental destruction include deforestation, drought and desertification, and destruction of wildlife. A study of seawater, sediment and fish tissue along Iran's Persian Gulf coastline showed severe oil pollution from the first Gulf War of 1991 (Jamshid 2011). In Iraq, Afghanistan and Pakistan the destruction of forests have increased carbon emissions and resulted in a reduced water supply. Iraqi health researchers have drawn attention to the need for more research into the potential link between conflict-related environmental pollution and the country's high rates of infection and disease (Costs of War 2013c).

Exposure to radioactive material can cause 'cancer, kidney damage, central nervous system damage, negative reproductive effects' (Inhorn 2008), congenital malformations and renal disease. High rates of cancer have recently been recorded in Gaza and Iraq, coinciding with the discovery of high levels of depleted uranium - a substance that is used to coat munitions and armour on tanks - in soil in the surrounding area (Inhorn 2008; Costs of War 2013c). Soil samples from the Gaza strip also found particles of caesium, asbestos dust, volatile organic compounds, phosphates, tungsten and thorium oxide (Al-Ghoul 2013). While exact causal pathways are debated, cancer is now the second-leading cause of death in Gaza, making a possible link highly likely and a priority for further research (see also 4c). Conflict conditions also mean the supply of medicines and other resources can be erratic and insufficient, which exacerbates the difficulties of managing and treating a chronic disease in insecure conditions (ibid).

#### **4i Displaced peoples**

The number of people displaced by military action against Iran would be strongly influenced by how the conflict developed. Initial air strikes would displace people internally, with all the attendant health consequences detailed below. As the conflict intensified the number of displaced would

rapidly increase and people could be forced to flee to neighbouring countries and beyond.

Conflict invariably displaces large numbers of people both within the country, as internally displaced people (IDPs), and across international borders as refugees. 7.6 million people globally were newly displaced in 2012 alone and 45.2 million forcibly displaced overall (UNHCR 2013a). The consequences of displacement can persist for years into the post-conflict period. Due to unstable physical and social conditions, restricted access to healthcare and the restrictions of refugee or IDP living conditions, displaced people tend to be more vulnerable to disease and psychosocial stress.

Recent events have led to an increase in the number of urban refugees by more than 50% globally, in contrast to previous displacement which led to many displaced people living in camps (Crisp 2010; Spiegel 2010; Tibaijuka 2010). These changes pose new challenges for displaced people but also the resident urban poor in the host country or city as it places further stresses on infrastructure, sanitation and shelter and can also heighten social tensions (Tibaijuka 2010). Compared to many resident urban poor, urban refugees lack social security systems and community support and may suffer from stigma and discrimination (Spiegel 2010). Displaced women and girls are far more likely to be victims of gender-based violence or sexual exploitation than non-displaced women and girls. A lack of legal status means women may have to engage in sex work to support families and in some situations there is a danger of kidnap, forced prostitution or rape by armed groups (Mowafi 2011). Additionally, a great number of displaced populations living in the Middle East are rarely granted refugee status (Mowafi 2011) creating stressful conditions of legal uncertainty.

If a military attack on Iran caused Iranian citizens to flee their country, they would face the added problem that several neighbouring countries – Iraq, Afghanistan and Pakistan – are themselves facing instability and conflict. Iran itself is host to a large number of refugees – an estimated 882,700 were registered with the Iranian authorities in December 2011 (UNHCR 2013b). These included 840,200 Afghans and 42,500 Iraqis, who might face double displacement back into their unstable home countries.

Diseases and conditions associated with displacement range from vitamin D deficiency and depression to leishmaniasis and malnutrition (Inhorn 2011). Given the demographics of Iran, refugees are likely to include the elderly and initial problems likely to be associated with non-communicable diseases and chronic illness such as cancer or kidney failure (Mowafi 2011). Maintaining the monitoring and treatment of these will be challenging in conditions of displacement.

Refugee and IDP flows can give rise to epidemics since infectious agents are more likely to be transmitted into new areas and to large numbers of people in crowded conditions. There is also evidence of the emergence and re-emergence of some infectious diseases affecting large numbers of people during conflict, in situations where several risk factors for transmission overlap and potentially magnify their individual effects (Gayer 2007). This emergence is influenced by environmental changes, human movement, breakdown in public health measures and overcrowding of temporary settlements. Diseases that had previously been eliminated can recur, due to displacement combined with unsanitary conditions and the disruption of public health control measures. During the present prolonged conflict in Syria (time of writing 2013), there are worrying signs of progressively worsening population health with an apparent increase in the incidence of diseases such as tuberculosis, hepatitis A and measles (Coutts 2013).

Communicable diseases can be particularly prevalent amongst displaced populations due to low levels of immunisation combined with poor living conditions, which can be optimum environments

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for disease transmission. Poor sanitation and overcrowding in refugee camps can lead to outbreaks of cholera (Coutts 2013) and reports of a typhoid epidemic in Syrian refugee camps at the time of writing are attributed to the fact that ‘five to six families [live] in a single house with no electricity, no water and bad quality food. It is impossible to have a good standard of hygiene in such a place’ (Burki 2013).

Health surveillance schemes and healthcare coverage may not reach displaced people. Pathogen resistance to drugs can emerge because of poor treatment compliance due, among other things, to lack of access to healthcare (Gayer 2007). In addition, if asylum seekers are not granted refugee status by the host country this lack of legal status may mean they have difficulty accessing healthcare even when it is available (Mowafi 2011).

The effects of daily stressors such as poor hygiene and overcrowding can have a detrimental effect on the mental health of the displaced. They may also suffer from additional daily stressors of exile such as having to adapt to a new culture, fear of being deported, isolation and discrimination. The social and material conditions of everyday poverty are an added burden for survivors of organised violence. Even if people have not had direct experience of violence, their experiences in refugee camps can be psychologically and physically damaging (Miller 2010). They may lack social support particularly if they have been separated from family and friends.

Studies of young Middle Eastern refugees in Denmark showed that 75% of them suffered from anxiety, sleep disturbance and/or depressed mood on arrival, though it also showed that these reduced over time (Montgomery 2011). The 2003 WHO Mental Health Survey of displaced Lebanese adults found that being displaced meant they were 37.7% more likely to have a disorder listed in the Diagnostic and Statistical Manual of Mental Disorder IV – the standard manual for diagnosing mental health problems. There was an increased chance of having such a disorder if refugees had witnessed somebody being killed, lost a loved one or sustained a life threatening injury. Similar data was found in an Iraq mental health survey conducted by WHO in 2009 (Mowafi 2011).

## **5. Reporting**

A range of expert advisors from different specialities have commented on this HIA. It is planned to distribute it to a wider range of stakeholders in a variety of ways including through a seminar / workshop to which key stakeholders will be invited. Results of these discussions will then be added as an annex, and shorter summaries of the HIA produced as appropriate.

The first objective of the workshop will be to take the findings of this HIA to a wider group of stakeholders, specifically those who are likely to be able to influence the decision making process in relation to any military action. Those invited to the workshop will include civil servants who are likely to be involved in some way in this.

A second objective will be to consider how to influence busy politicians with limited time with the sort of information presented in the HIA. It is vital that reporting of the HIA is relevant for the target group of decision makers, and to facilitate discussion on this the HIA will also be made available as a draft shorter document.

A third objective of the workshop will be to encourage further use of HIA in relation to potential military action / violent conflict. There is a wealth of evidence on the health consequences of conflict, and this urgently needs to be used to a greater degree to understand in advance the effects of certain actions. If it is not used in this way it is possible that a key function of this data and

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information will not have the influence it should in relation to conflict prevention.

Reporting will need to emphasise that HIA is a widely used methodology, and that in other areas it has been widely accepted as a decision making tool. Communicating the basis of estimations of likely future events is always challenging, but can be helped by the sort of framework the HIA methodology provides, and through clear explanation and good sources of information and data. The fact that routine and widely accepted HIAs also have to deal with uncertainty and estimation will need to be emphasised.

Communicating the basis of the assessments included in this HIA to the media in a clear and concise way is equally challenging. It will be important that this is done at the appropriate time, and communications are adapted for different outlets. It is planned to start with the health media and an article in a health journal has already been discussed. There will also be an emphasis on the professional input to the HIA, and the efforts that have been made to be objective and clear in relation to the data and information used.

The opinions of stakeholders will be sought on how best to tackle all these issues and to take this work forward.

## **6. Conclusions and recommendations**

- The specific recommendation of this HIA is that no military force should be used as a means to try and resolve differences with Iran.
- Given the evidence presented in this HIA we recommend that decision makers should work to find a negotiated, non-military solution to differences with Iran.
- The overall recommendation, to support which this case study has been undertaken, is that decision makers should take the full health consequences of conflict into account when military action is being considered.
- We conclude that the fact that military action is still 'on the table' means that the full health consequences of military action have not been understood or taken into account in this case.
- Recommendations as to what peaceful initiatives should be undertaken cover different areas of experience and expertise and have been made by others. However we would emphasise the importance of including Iran in discussions that concern its interests, and of avoiding placing conditions on talks that are likely to reduce the likelihood of them taking place.
- We would also recommend lifting the present sanctions regime. Although these sanctions are portrayed as 'smart' sanctions they are in fact damaging the health of civilians. The recent elections in Iran have presented a window of opportunity and to do this would be a goodwill gesture towards cooperation.
- We recommend that more work be undertaken to build up experience and expertise in the use of HIA methodology and conflict, as this is a work in progress. This work can also build links with those who are improving methodologies for collecting health data and information during and after conflict, and expand the evidence base on which future HIAs can draw.

## 7. Monitoring and evaluation

Process indicators to monitor and finally evaluate this HIA will include:

- the amount of media coverage and citations
- quality of coverage in terms of clear explanation
- the number of times mention of the HIA is made by decision makers, and any indications that it has influenced their thinking in the desired direction
- the number of downloads of the HIA in its various forms from the Medact website
- direct requests for copies or discussion – outcomes of same
- interest in the workshop, its outcome and follow up.

The interest of the expert advisors / key informants and their willingness to contribute their time has been very encouraging, and an indication of possible wider interest from researchers and others.

In the event of military action taking place, the evidence presented in this HIA will not have influenced decision makers in the way it intends. The accuracy of its estimations will be able to be made in the short and longer term.

If military action does not take place the actual influence of this HIA in preventing such action will be difficult to evaluate. However decision makers will have been influenced by multiple factors, one of which is very likely to be their concern about the health consequences of military action.

If this HIA generates an increase in the use of HIA in relation to conflict and/or more discussion of its usefulness for this purpose, it will have also achieved one of its aims.

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