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COMMENTARY

Renewing the call for public health advocacy against nuclear weapons

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Introduction

While the Cold War was raging in the 1980s, getting public health schools in the Global North to take a position against nuclear weapons, and to advocate for inclusion of the arms trade and violence in medical and public health curricula, was far easier than it is today. A million-person demonstration in Central Park included the prominent participation of Physicians for Social Responsibility (Kramer 1982). The Institute of Medicine and National Academy of Sciences produced a volume on *The Medical Implications of Nuclear Weapons* (Solomon and Marston 1986). In 1984 and 1987, the World Health Organization issued reports that presented evidence on radiation, firestorms and climatic effects of nuclear war on health and health services. It found that 'the only approach to the treatment of the health effects of nuclear explosions is … the primary prevention of atomic war' (WHO 1984/1987). The American Public Health Association (APHA) led a demonstration to the Nevada nuclear test site that resulted in high profile arrests and free publicity (Applebome 1986). Throughout the 1980s, scores of Deans of medical and public health schools endorsed the abolition of nuclear weapons.

Achieving such organizational endorsement today is far more challenging. Some may believe that the battle is won, others that this threat is of lesser priority, and some still believe that there is no role for public health in political or military matters. This paper is meant to rebut these arguments, to provide a historical perspective, and to renew the case for public health advocacy on nuclear weapons.

Public health and social responsibility

Public health is grounded in a covenant with society. The Hippocratic oath (National Kidney and Transplant Division of Urology 1999), the ethical

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underpinning of clinical medicine, governs the responsibility of a physician to patients, colleagues and society. Concepts such as professionalism, social responsibility and accountability have become universally accepted by medical bodies and schools (ABIM Foundation, ACP–ASIM Foundation, and European Federation of Internal Medicine 2002; Global Consensus for Social Accountability of Medical Schools 2010; Gruen, Pearson, and Brennan 2004). The US Institute of Medicine defined public health as 'what we as a society do collectively to assure the conditions in which people can be healthy' (IOM Institute of Medicine 1988). Ethics, at a population level, are central to public health as it seeks to reduce inequities and disparities by targeting vulnerable populations (CDC 2015; Childress et al. 2002; Schroder-Back et al. 2014; WHO 2008). But how far should campaigning against nuclear weapons be seen as an essential part of such work? Here, those working in public health can draw lessons from other professions who have viewed action against nuclear weapons as central to their role since the dawn of the nuclear age.

Advocacy in the nuclear age: scientists and civil society

After the Second World War, scientists who had been involved in the war effort, concerned about the future of the planet, worked against nuclear weapons. Robert Oppenheimer, father of the Atomic bomb and leader of the Manhattan project, especially upset by the second bomb dropped on Nagasaki, went to President Truman lamenting having 'blood on my hands'. Truman, who had given the order to drop the only nuclear bombs used (so far) in more than 70 years of their existence responded coldly, 'Never mind. It'll all come out in the wash' (Shapin 2000). Oppenheimer turned against the US unilateral possession of the bomb and spoke out against the development of massive hydrogen bombs resulting in his vilification, FBI surveillance and, in 1954, revocation of his security status (NAPF 2017).

Albert Einstein, a major proponent of the development of the Bomb when he felt that the Nazis were likely to get there first, co-authored a manifesto with Bertrand Russell shortly before his death in 1955, highlighting the dangers of the nuclear arms race and calling for a conference of scientists in the Nuclear Age (Born et al. 1955). Shortly after, industrialist Cyrus Eaton convened these scientists in his sleepy Nova Scotia hometown of Pugwash. One of these, Joseph Rotblat, medical physicist and the first scientist to resign in protest from the Manhattan project, became Secretary-General of the Pugwash Conferences, with whom he shared the 1995 Nobel Peace Prize (Ham 2015; Pugwash.org 2017).

Soon, evidence of the damaging health effects of nuclear testing on Marshall Islanders, and even within the US effects from accidental (or perhaps deliberate) exposure to above-ground nuclear testing, became apparent, particularly in terms of thyroid cancers and leukaemias. Swiss physician Albert Schweitzer,

renowned for humanitarian work in Lambaréné hospital in Gabon, used the prestige of his 1952 Nobel Peace Prize to make a 1957 radio address to the Nobel Peace Prize Committee, broadcast in 50 countries (but not the US), to awaken the global public to the terrible health effects of nuclear testing. 'Experts' such as William Libby, head of the Atomic Energy Commission, were quick to respond, declaring radiation effects of fallout to be negligible (New York Times, Apr. 24, 1957). In 1957, Rotblat chaired the British Atomic Scientists' Association committee to formally assess this risk, concluding (among other risks) that for each megaton exploded in the atmosphere about 1000 people were likely to develop bone cancers (British Atomic Scientists' Association 1957). 1954 Nobel Prize winner for Chemistry Linus Pauling, concerned by health effects of Strontium 90, as evidenced by, for example, levels in the deciduous teeth of children, won another Nobel Prize for Peace in 1962 for gathering together scientists to support a ban on testing and oppose the hydrogen bomb (Nobelprize.org 2014). These efforts helped swing the tide of public opinion against testing and, perhaps, promoted the 1963 limited test ban treaty

Civil society efforts mobilized the Campaign for Nuclear Disarmament. Women have been major forces in the antinuclear movement, for example, in Britain with demonstrations at Greenham Common and Sellafield (CND 2017). A boycott of GE culminated with health professional shareholders addressing the company's annual meeting, which probably contributed to GE divesting from the nuclear industry (CAI 2017). During the 1990s hundreds of cities, countries and regions were declared nuclear-free zones (UNODA n.d.). In 1993, the World Health Assembly of the World Health Organization, as a UN body, formally requested an advisory opinion from the International Court of Justice on the legal status of nuclear weapons. In 1996, the Court ruled, 'that the threat or use of nuclear weapons would generally be contrary to the rules of international law applicable in armed conflict, and in particular the principles and rules of humanitarian law'; and unanimously ruled that, 'There exists an obligation to pursue in good faith and bring to a conclusion negotiations leading to nuclear disarmament in all its aspects under strict and effective international control' (ICJ 1996; NTI 2017).

Mobilizing the public against nuclear power

As well as advocating against nuclear weapons, many in the worldwide anti-nuclear movement have also opposed nuclear power. In 1985, Greenpeace's *Rainbow Warrior* publicly evacuated 300 Marshall Islanders exposed to France's above-ground testing, embarrassing the only power to conduct such testing after the Nuclear Test Ban treaty in the early 1960s. Later that year, French secret service agents bombed the ship in Auckland harbour, inadvertently killing a Portuguese-Dutch photographer. The publicity and the subsequent conviction

of the perpetrators in a New Zealand court increased opposition to French testing (Simons and Maman 2014).

After Three Mile Island (1979), Chernobyl (1986), and Fukushima (after the 2011 tsunami) (NPR 2011) fears of meltdown turned many against nuclear power. While 'experts' once again cite the safety of modern reactors, and a lack of evidence of harmful radiation from power plants, advocates point to a lack of interest in studying the health impacts of nuclear power in light of a 1959 agreement between the WHO and the IAEA. The WHO denies the agreement reduces its willingness to study the radiation effects of the nuclear industry (WHO 2001). Epidemiologists have attempted independent studies (e.g. Kaatsch et al. 2008). Of course, beyond accidents and radiation risk to workers and those around plants, the cost, waste, secrecy and relationship between civilian nuclear power and the proliferation of nuclear weapons, are other equally valid reasons for critically evaluating nuclear power compared to the alternatives. At least in some countries Fukushima fueled protests, turning the tide of public opinion, leading to Germany agreeing to phase out all of its nuclear power plants by 2022 and Japan by 2040 (though the latter has hedged on this recently).

Public health advocacy opposing direct violence

Public health leaders have highlighted the effect of the arms trade on health priorities (Sidel 1995), the impact on Iraq of the 1991 Gulf War (Ascherio et al. 1992), sanctions (Arya and Zurbrigg 2003) and the 2003 war (Burnham et al. 2006; Roberts et al. 2004; Salvage 2002). Prior to the Centres for Disease Control (CDC) being defunded to prevent it from examining the impact of gun violence (Raphael 2015), studies at a microlevel were conducted in the US (Kellermann et al. 1992, 1993; Sloan et al. 1988) but continue internationally (Paniagua et al. 2005). AQ1 AQ2

WHO reports illustrate the massive public health problem of violence (Murray et al. 2002; WHO 2002, 2017). The APHA Peace Caucus issued a report in the *American Journal of Public Health* on the role of public health in the prevention of war (Wiist et al. 2013). Levy and Sidel's *War and Public Health* remains the definitive text on the subject (Levy and Sidel 2008). AQ3

Yet, an IOM report on prevention of psychological harm to combatants (Denning, Meisnere, and Warner 2014) failed to even mention the prevention of violence as a role for public health. When questioned, Laura Aiuppa, Senior Programme Officer at the Institute of Medicine and Study Director for *Preventing Psychological Disorders in Service Members and Their Families: An Assessment of Programmes* responded,

> … From our institution's viewpoint, whether the reasons for going to war outweigh the deaths and injuries war causes is not a scientific question; it is a moral and political judgment. Because the decision to enter into a war is inherently a political and moral one, we would be unable to objectively provide any recommendations related to avoiding war as a preventive measure. (personal correspondence email April 10, 2014)

Advocates who are health professionals use the public perception of altruism, impartiality, and their ethical responsibility for beneficence and nonmaleficence to continue to fight for peace. Some argue that it is a medical responsibility (Arya 2013). There are many examples of public health leadership. In 2011, the World Federation of Public Health Associations (WFPHA) recommended that public health professionals become active advocates for legislation related to the arms trade, the ratification of treaties and protocols related to war, and the development of initiatives that address the structural causes of war (World Federation of Public Health Associations 2011).

Public health advocacy against nuclear weapons

The first foreign doctor to arrive in Hiroshima after the bombing, to assess effects and treat victims, was ICRC delegate Marcel Junod. Junod sent a cable to Geneva on 30 August 1945:

> … Conditions appalling. City wiped out. Eighty per cent all hospitals destroyed or seriously damaged. Inspected two emergency hospitals. Conditions beyond description. Effect of bomb mysteriously serious. Many victims apparently recovering suddenly suffer fatal relapse due to decomposition of white blood cells and other internal injuries now dying in great numbers. Estimated still over one hundred thousand wounded in emergency hospitals located surroundings, sadly lacking bandaging materials, medicines…. (Junod 1982)

Public health research contributed to data on the health effects of radiation through Hiroshima epidemiological studies. Well-known public health physicians Jack Geiger, Victor Sidel and Bernard Lown (the inventor of the implantable defibrillator) authored a 1962 study demonstrating the futility of a medical response to a nuclear attack on Boston, with insufficient burn beds in all of the US to deal with the victims and radiation-causing cancers decades later (Sidel, Geiger, and Lown 1962). In the early 1980s, Helen Caldicott revived Physicians for Social Responsibility and energized the movement with *If you love this planet* talks, which later turned into an Academy Award-winning documentary.

Lown joined his friend and fellow expert on Sudden Cardiac Death, Evgeni Chazov, cardiologist to the Soviet elite, to form International Physicians for the Prevention of Nuclear War (IPPNW) in 1980. Lown and Chazov mobilized physicians across the globe calling for the abolition of nuclear weapons, a potential cause of sudden planetary death. The pair wondered why they should be going to conferences to discuss how to work together to save individuals when their countries were plotting the destruction of tens of millions of their families, friends and fellow citizens. They humanized the 'enemy' depersonalized, by the Cold War, spreading the public health message that nuclear weapons, like smoking, are bad for health. In doing so they helped change public discourse around nuclear weapons, away from discussions of military strategy towards a recognition that nuclear war was unwinnable and should never be fought, or even contemplated. For this work, IPPNW won the Nobel Peace Prize in 1985.

The organization gained important converts. In *Perestroika,* Mikhail Gorbachev credited IPPNW with changing his mind:

> The International Physicians for the Prevention of Nuclear War has come to exercise a tremendous influence on world opinion in quite a short period of time…. For what they say and what they do is prompted by accurate knowledge and a passionate desire to warn humanity about the danger looming over it. In the light of their arguments and the strictly scientific data which they possess no serious politician has the right to disregard their conclusions. (Gorbachev 1987)

More recently, IPPNW members have added to the literature on the public health effects of nuclear weapons with studies on accidental nuclear war (Helfand et al. 2002). Human error, computer failure or perhaps a cyber attack launched by a terrorist group, all could lead to the unintended launch of nuclear weapons and there have been many close calls in the nuclear age (Forrow et al. 1998). Since 9/11, there has been increased concern about non-state nuclear terrorism, whether through dirty bombs or attacks on nuclear facilities.

Recent updates on the health effects of nuclear weapons

Recently, it has seemed that the greatest risk, short of an accidental launch, or an unpredictable event from North Korea, is the possibility of a limited nuclear war between India and Pakistan. The two have gone to war three times since Independence and the disputed territory in Kashmir is managed through a very tenuous line of control. Though India had stopped nuclear testing after 1974, it resumed in 1998, followed weeks later by Pakistan. Both non signatories to the nuclear non proliferation treaty (NPT), India and Pakistan publically declared themselves as having nuclear capability. Since then, a limited skirmish has occurred over Kargil in the remote Himalayas, tensions have been heightened after terrorist attacks on the Indian and Indian Kashmiri parliaments in 2001, and on Mumbai 2008. Both India and Pakistan take pride in their nuclear weapons: a former Pakistani President declared they would have the bomb even if the people had to eat grass. India has pledged to not launch a first strike, but should Pakistani radicals, threatened army or intelligence operatives choose such action, it reserves the right to respond.

IPPNW looked at the effects of a single 150 kiloton bomb on Mumbai, which would cause between 736,000 and 8,660,000 deaths (Ramana 1999). If each side were to use fifty 15 kiloton, Hiroshima-sized weapons (small by current standards), which would be less than half of their current arsenals (and less than half a per cent of the world's arsenals), on the other's population centres, it was predicted that within the first week more than 20 million people would die directly from blast effects of explosions, burns from fires and radiation (Toon et al. 2007). While this is horrific, recent studies demonstrate that the global long-term damage could be far greater.

IPPNW first estimated that the number at risk of famine from even such a limited regional war would be one billion (Helfand 2012). This was later revised up to at least two billion (Helfand 2013). How did Helfand and IPPNW arrive at such dramatic figures? A 2006 study by climate, atmospheric and oceanic scientists Alan Robock and Brian Toon determined that fires caused by these hundred nuclear explosions would inject 5–6.5 million tonnes of black soot so high into the atmosphere that it could not be washed out by rainfall and would persist for a decade, blocking out sunlight and reducing surface temperatures across the planet by an average of 1.3 °C. The internal regions of major continents, the bread baskets, might experience severe effects on production, with cooling causing shortened growing seasons and decreased precipitation as less water evaporated from the oceans (Toon, Robock, and Turco 2008). This soot heating the upper atmosphere would also substantially decrease stratospheric ozone, allowing more UV light to reach the earth's surface, further reducing crop yields (Robock et al. 2007; Robock, Oman, and Stenchikov 2007).

Quantifying such effects required agriculture and food security specialists using data from sources including the US Department of Agriculture and the UN Food and Agriculture Organization. Researchers found that US corn production would be down an average 10–12% for a decade, with the biggest reductions (of about 20%) occurring in year five. US soybean production would decrease by 7% (Ozdogan, Robock, and Kucharik 2013). In China, rice production would be down more than 20% in the first four years, and by 10% during the next six (Ozdogan, Robock, and Kucharik 2013). Winter wheat would be down 50% in the first year and about 31% average for decade, and maize down 16% (Xia and Robock 2013). It was the inclusion of Chinese maize and winter wheat production that increased mortality to two billion.

When considering food security we would need to consider that with world grain reserves of about 10 to 12 weeks, markets would not function normally. Suspension of exports by grain-exporting countries who would want to feed their own restive populations could result in panic, causing hoarding and increased prices. The more than 800 million people globally who are chronically malnourished, with a baseline consumption of 1800 calories or less per day, enough to maintain body mass with minimal physical work, would all be at risk of starvation with even a 10% decline in their food consumption. So too would 300 million people living in North Africa and the Middle East and the wealthy industrial countries of East Asia, Japan, South Korea and Taiwan where, although most people enjoy adequate nutrition today, much of the food is imported. Finally, adding in another billion people in China earning less than five dollars per day, brings us to a figure of more than two billion. How would a decade of severe economic and social instability affect China? Running simulations on other temperate-zone grain producers such as Canada and Russia might magnify the shortfalls.

Damage caused by the accidental launch of a single Trident missile, each of which is 10 to 30 times more powerful than the weapons that were considered in the South Asia study, would make that damage pale in comparison. The United States has 14 Trident submarines, together with land-based missiles and strategic bombers armed with cruise missiles and gravity bombs (Helfand 2013). A 2002 study showed that if just 500 Russian weapons were launched from the Russian arsenal on urban targets in the United States, 75–100 million people would die in the first half-hour from the firestorms and explosions (Helfand, Forrow, and Tiwari 2002). With infrastructure increasingly interconnected by the internet, including the electrical grid, banking, public health systems, and food distribution networks, those who failed to die immediately would succumb to exposure, starvation and epidemic disease in subsequent months. However, if we add climatic effects, this use of strategic weapons would lower average global temperatures by 8 °C with 150 million tonnes of soot in the upper atmosphere, meaning that temperatures in the interior regions of North America and Eurasia would fall by 25–30 °C. With the temperature dropping below freezing daily for two years, agricultural food production would stop, basically destroying civilization (Robock, Oman, and Stenchikov 2007 quoted in Helfand et al. 2017).

Recent advocacy led by international health organizations on nuclear weapons

In 2011, the Red Cross Movement, including 187 Red Cross and Red Crescent National Societies and the International Federation of Red Cross and Red Crescent Societies, very mindful of impartiality and its apolitical stance, was

> deeply concerned about the destructive power of nuclear weapons, the unspeakable human suffering they cause, the difficulty of controlling their effects in space and time, the threat they pose to the environment and to future generations and the risks of escalation they create. (International Committee of the Red Cross 2011)

They almost unanimously adopted a resolution calling for all states to urgently pursue and conclude a legally binding international agreement to prohibit the use of, and completely eliminate, nuclear weapons (ICRC 2013a).

In 2013, the ICRC adopted a four-year action plan to launch educational campaigns on 'the catastrophic humanitarian consequences' of nuclear war, working with IPPNW medical and scientific expertise to develop materials such as a new ICRC booklet, *Climate effects of nuclear war and implications for global food production* (ICRC 2013b). In October 2015, a meeting of the General Assembly of the World Medical Association in Moscow unanimously adopted a resolution stating that the medical profession has a duty to work for the elimination of nuclear weapons. In 2016, the same body urged all governments to work to ban and eliminate nuclear weapons (WMA 2017). AQ5

Over the last two decades, concerns that the nuclear powers have neglected their obligations to work towards nuclear as well as general and complete

disarmament under Article VI of the 1968 Nuclear non Proliferation Treaty (NPT) have risen. For two decades, states actually expanded their arsenals, and for the following three considered them a cornerstone of 'defence' into perpetuity, finally spurring frustrated non-nuclear weapon states to begin collaborations with civil society groups. A 2005 call by Malaysian obstetrician Ron McCoy was taken up by IPPNW, its Australian affiliate MAPW, and Australian doctors and such as Tilman Ruff and Sue Wareham, spawning ICAN, the International Campaign to Abolish Nuclear Weapons. ICAN now has 440 partner organizations in 100 countries (ICAN 2016). AQ6

In 2010, International Committee of the Red Cross (ICRC) president Jacob Kellenberger declared that the elimination of nuclear weapons would be a renewed priority, beginning the 'Humanitarian Initiative' (Kellenberger 2010), AQ7 later to become the Humanitarian Pledge. Conferences followed in March 2013 in Oslo (Ministry of Foreign Affairs (Norway) 2013), February 2014 in Nayarit, Mexico (Government of Mexico Chair's Summary 2014) and December 2014 in Vienna, each convened by their respective governments. Each conference examined the humanitarian consequences of nuclear war and the implications of these data for nuclear policy, striving to create the conditions necessary for the elimination of nuclear weapons. The last, attended by about 150 states, was subject to a boycott by nuclear states and their allies.

This Humanitarian Initiative moved to the UN General Assembly on Nuclear Disarmament with the backing of Austria (UN 2013a), and was promoted by countries such as South Africa (UN 2013b), which had renounced and disposed of its nuclear weapons with the fall of Apartheid (Government of South Africa 2013). IPPNW, the World Medical Association, the World Federation of Public Health Associations and the International Council of Nurses, submitted a joint Working paper submitted to the Open-Ended Working Group Taking Forward Multilateral Nuclear Disarmament Negotiations (OEWG) in May 2016 (IPPNW 2016). More than 125 countries have endorsed the Humanitarian Pledge to stigmatize, prohibit and eliminate nuclear weapons, and to fill the legal gap in nuclear disarmament and have begun negotiations towards a Nuclear Weapons Convention (Humanitarian Pledge). On 12 October 2016, Mexico, Austria, Ireland, Brazil, Nigeria and South Africa tabled Resolution L.41 at the UN General Assembly First Committee, to convene negotiations on a legally binding instrument to prohibit nuclear weapons and move towards their total elimination (WILPF, 2017). This was adopted on 27 October 2016 by a vote of 123–38 and 16 abstentions. On 7 July 2017, a Treaty on the Prohibition of Nuclear Weapons was adopted by a vote of 122–1–1 prohibiting the development, testing, manufacture, acquisition, possession, stockpiling, use and threat of use. It will open for signature in September and will be in force once 50 states have ratified it (United Nations News Centre 2017).

Whither public health?

The World Federation of Public Health Associations 2011 policy on armed conflict and war describes 'the essential role of all public health practitioners in the prevention of war and its public health consequences' (World Federation of Public Health Associations 2011). An editorial in the *Australian and New Zealand Journal of Public Health* (Ruff and Helfand, 2012) termed nuclear weapons elimination a public health imperative in Helfand et al. (2014) described the medical responsibility, and in 2015 noted public health and social medicine founder Vic Sidel challenged the medical community to re-engage with the mission (Helfand and Sidel 2015). AQ8

Yet public health bodies now appear reluctant to advocate against nuclear weapons and teach of their menace. In 2012, 30 Deans of US schools of medicine and public health called on colleagues in the 'medical and public health communities to educate their colleagues, patients and communities about the enormous danger we face as long as nuclear weapons exist' (Frumkin, Helfand, et al. 2012). There are more than 140 accredited medical schools and over 50 schools of public health in the US. We need to get all on board.

Rather than taking a leading role when the UK decided to renew its Trident 'deterrent', or rising up against the militarism and casual nuclear threats of the current US Administration, public health has remained quiet, even as a previous Canadian government withdrew the charitable status of Physicians for Global Survival, the IPPNW Canadian affiliate, considering its mission too political (Beeby 2010).

With nuclear weapons still being one of the greatest threats to planetary survival, public health cannot afford to be silent. Speaking out against the most immediate possibility of global annihilation must be intrinsic to public health education and advocacy. Public health practitioners, particularly those in nuclear weapon states, must advocate for abolition and joining the new Treaty. AQ9

Disclosure statement

No potential conflict of interest was reported by the author. AQ10

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References

ABIM Foundation, ACP–ASIM Foundation, and European Federation of Internal Medicine. 2002. "Medical Professionalism in the New Millennium: A Physician Charter." *Annals of Internal Medicine* 136 (3): 243–246. doi:10.7326/0003-4819-136-3-200202050-00012.

Applebome, P. 1986. "139 Arrested in Protest at Nevada Nuclear Test Site." *New York Times,* October 1. https://www.nytimes.com/1986/10/01/us/139-arested-in-protest-at-nevada-nuclear-test-site.html.

Arya, N. 2013. "Advocacy as Medical Responsibility." *Canadian Medical Association Journal* 185 (15): 1368. doi:10.1503/cmaj.130649. AQ11

Arya, N., and S. Zurbrigg. 2003. "Operation Infinite Injustice: Impact of Sanctions and Prospective War on the People of Iraq." *Canadian Journal of Public Health* 94 (1): 9–12.

Ascherio, A., R. Chase, T. Cote, G. Dehaes, E. Hoskins, J. Laaouej, M. Passey, et al. 1992. "Effect of the Gulf War on Infant and Child Mortality in Iraq." *New England Journal of Medicine* 327 (13): 931–936. https://content.nejm.org/cgi/content/abstract/327/13/931.

Beeby, D. 2010. "Conservative Government Steps up Scrutiny of Charities' Political Activities." *The Globe and Mail*. https://www.theglobeandmail.com/news/politics/study-cites-chill-from-tax-agency-audits-of-charities-political-activities/article19551584/.

Born, et al. 1955. "The Russell-Einstein Manifesto". https://pugwash.org/1955/07/09/statement-manifesto/.

British Atomic Scientists' Association. 1957. "Strontium Hazards." *Bulletin of – the Atomic Scientists* XIII: 202–203.

Burnham, G., R. Lafta, S. Doocy, and L. Roberts. 2006. "Mortality After the 2003 Invasion of Iraq: A Cross-sectional Cluster Sample Survey." *The Lancet* 368 (9545): 1421–1428..

CND (Campaign for Nuclear Disarmament). 2017. *Nuclear Timeline*. https://www.cnduk.org/campaigns/global-abolition/effects-of-nuclear-weapons/item/446-nuclear-timeline.

CDC (Centers for Disease Control and Prevention). 2015. "Public Health Ethics". Office of the Associate Director for Science. *CDCP*. May https://www.cdc.gov/od/science/integrity/phethics/index.htm.

Childress, J. F., R. R. Fraden, R. D. Gaare, L. O. Gostin, J. Kahn, R. J. Bonnie, N. E. Kass, A. C. Mastroianni, J. D. Moreno, and P. Nieburg. 2002. "Public Health Ethics: Mapping the Terrain." *The Journal of Law, Medicine & Ethics* 30 (2): 170–178.

CAI (Corporate Accountability International). 2017. Boycott Stops GE's Nuclear Weapons Business. https://www.stopcorporateabuse.org/success/boycott-helps-compel-ge-stop-manufacturing-nuclear-weapons.

Council of Delegates of the International Red Cross and Red Crescent Movement. 2013a. "Working Towards the Elimination of Nuclear Weapons: Four-year Action Plan." https://www.icrc.org/eng/assets/files/red-cross-crescent-movement/council-delegates-2013/cod13-r1-nuclear-weapons-cd13r1-eng.pdf. AQ12

Denning L. A., M. Meisnere, K. E. Warner, eds. 2014. Preventing Psychological Disorders in Service Members and Their Families: An Assessment of Programs. Washington, DC: National Academies Press. 4, Evidence for Department of Defence Interventions for Preventing Psychological Disorders. https://www.ncbi.nlm.nih.gov/books/NBK222171/.

Forrow, L., B. G. Blair, I. Helfand, G. Lewis, T. Postol, V. Sidel, B. S. Levy, H. Abrams, and C. Cassel. 1998. "Accidental Nuclear War – A Post-Cold War Assessment." *New England Journal of Medicine* 338: 1326–1332. https://www.nejm.org/doi/full/10.1056/NEJM199804303381824#t=article.

Frumkin, H., I. Helfand, et al. 2012. "A Prescription for Survival: Prevention of Nuclear War." *American Journal of Preventive Medicine* 42 (3): 329–331.

Global Consensus for Social Accountability of Medical Schools. 2010. "Global Consensus for Social Accountability of Medical Schools." Accessed 24 October 2015. https://healthsocialaccountability.org/

Gorbachev, M. 1987. *Perestroika: New Thinking for our Country and the World.* New York: Harper & Row. 154.

Government of Mexico Chair's Summary. 2014. Second Conference on the Humanitarian Impact of Nuclear Weapons. Nayarit: Government of Mexico. https://www.reachingcriticalwill.org/images/documents/Disarmament-fora/nayarit-2014/chairs-summary.pdf.

Government of South Africa. 2013. "Joint Statement on the Humanitarian Impact of Nuclear Weapons." April 24, 2013 on behalf of the Humanitarian Initiative during the second session of the Preparatory Committee for the 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons.

Gruen R., S. Pearson, and T. Brennan. 2004. "Physician-Citizens – Public Roles and Professional Obligations." *JAMA* 291 (1): 94–98. https://www.ncbi.nlm.nih.gov/pubmed/14709581.

Ham, P. 2015. "As Hiroshima Smoldered, our Atom Bomb Scientists Suffered Remorse." *Newsweek*. https://www.newsweek.com/hiroshima-smouldered-our-atom-bomb-scientists-suffered-remorse-360125.

Helfand, I. 2012. "Nuclear Famine: A Billion People at Risk." *International Physicians for the Prevention of Nuclear War*. https://www.ippnw.org/pdf/nuclear-famine-ippnw-0412.pdf.

Helfand, I. 2013. "Nuclear Famine: Two Billion People at Risk?" *International Physicians for the Prevention of Nuclear War*. 2nd ed. https://www.ippnw.org/pdf/nuclear-famine-two-billion-at-risk-2013.pdf. AQ13 AQ14

Helfand, I. and V. Sidel. 2015. "Docs and Nukes – Still a Live Issue." *New England Journal of Medicine* 373: 1901–1903.

Helfand, I., L. Forrow, J. Tiwari. 2002. "Nuclear Terrorism." *BMJ* 324. doi: 10.1136/bmj.324.7333.356 (Published 09 February 2002). https://www.bmj.com/content/324/7333/356.

Helfand, I., A. Junkkari, and O. Ogebe. 2014. "Preventing Nuclear War: A Professional Responsibility for Physicians." *Virtual Mentor. AMA Journal of Ethics* 16 (9): 739–744, September. http://journalofethics.ama-assn.org/2014/09/pfor1-1409.html. AQ15

Helfand, I., A. Haines, T. Ruff, H. Kristensen, P. Lewis, and Z. Mian. 2017. "The Growing Threat of Nuclear War and the Role of the Health Community." *World Medical Journal* 62 (3): 86–95. https://www.wma.net/wp-content/uploads/2017/03/wmj201603.pdf.

Helfand, I., L. Forrow, M. McCally, and R. K. Musil. 2002. "Projected US Casualties and Destruction of US Medical Services From Attacks by Russian Nuclear Forces." *Medicine and Global Survival* 7 (2): 68–76. AQ16

ICAN. 2016. "The UN Should Mandate Negotiations for a Treaty Banning Nuclear Weapons." *Statement Delivered by Jasmin Nario-Galace to the First Committee of the UN General Assembly*, October 12. https://www.icanw.org/campaign-news/the-un-should-mandate-negotiations-for-a-ban-on-nuclear-weapons/.

ICAN Humanitarian Pledge. https://www.icanw.org/pledge/. AQ17

International Committee of the Red Cross. 2011. *31st Council of Delegates Nov 2011: Resolution 1. Working Towards the Elimination of Nuclear Weapons*. Geneva: ICRC. https://www.icrc.org/eng/assets/files/publications/icrc-002-1130.pdf.

ICRC (International Committee of the Red Cross). 2013b. *Iraq: A Decade of Sanctions 1989–1999*. Geneva: ICRC. https://www.icrc.org/eng/resources/documents/legal-fact-sheet/03-19-nuclear-weapons-global-food-production-2-4132.htm.

ICJ (International Court of Justice). 1996. "Le-alie of the Threat or Use of Nuclear Weapons: Request for Advisory Opinion by the General Assembly of the United Nations." *ICJ* 96 (23). https://www.icj-cij.org/files/case-related/95/10407.pdf.

IOM Institute of Medicine. 1988. *The Future of Public Health*. Washington, DC: National Academy Press.

IPPNW. 2016. "The Health and Humanitarian Case for Banning and Eliminating Nuclear Weapons." Working paper A/AC.286/NGO/18, May 4. https://ippnweupdate.files.wordpress.com/2016/04/health-and-humanitarian-case-for-banning-and-eliminating-nuclear-weapons_oewg-may-2016.pdf.

Junod, M. 1982. The Hiroshima Disaster. *International Review of Red Cross*. 22(231) also quoted in https://e-brief.icrc.org/issue/nuclear-weapons-the-human-cost/part-2-addressing-the-threat/.

Kaatsch, P. C. Spix, I Jung, and M. Blettner. 2008. "Childhood Leukemia in the Vicinity of Nuclear Power Plants in Germany." *Deutsches Ärzteblatt International* 105 (42): 725–732. PMC. Web. 5 July 2017.https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2696975/.

Kellenberger, J. 2010. Bringing the Era of Nuclear Weapons to an End. Geneva: Statement to the Geneva Diplomatic Corps. April 20. https://www.icrc.org/eng/resources/documents/statement/nuclear-weapons-statement-200410.htm.

Kellermann, A. L., F. P. Rivara, G. Somes, et al. 1992. "Suicide in the Home in Relation to Gun Ownership." *New England Journal of Medicine* 327: 467–472. AQ18

Kellermann, A. L., F. P. Rivara, and N. B. Rushforth. 1993. "Gun Ownership as a Risk Factor for Homicide in the Home." *New England Journal of Medicine* 329: 1084–1091. AQ19

Kramer, M. 1982. 'The Fate of the Freeze'. *New York Magazine*, June 14. pp 23–25. AQ39

Levy, B. S., and V. W. Sidel, eds. 2008. *War and Public Health*. 2nd ed. New York: Oxford Univ. Press.

Ministry of Foreign Affairs (Norway). 2013. Conference: Humanitarian Impact of Nuclear weapons Oslo, Norway 4–5 March 2013 https://www.regjeringen.no/en/topics/foreign-affairs/humanitarian-efforts/humimpact_2013/id708603/.

Murray, C. J., G. King, A. D. Lopez, N. Tomijima, and E. G. Krug. 2002. "Armed Conflict as a Public Health Problem." *British Medical Journal* 324: 346–349. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1122272/. AQ20

National Kidney and Transplant Division of Urology. 1999. "The Hippocratic Oath." https://members.tripod.com/nktiuro/hippocra.htm. AQ21

Nobelprize.org. 2014. "Linus Pauling – Facts". *Nobel Media*. https://www.nobelprize.org/nobel_prizes/peace/laureates/1962/pauling-facts.html.

NPR. 2011. Fukushima, Three Mile Island, Chernobyl: Putting it All in Perspective. NPR. https://www.npr.org/2011/03/17/134568383/japan-three-mile-island-chernobyl-putting-it-all-in-perspective.

NTI. 2017. Proposed Nuclear Weapons Convention (NWC). NTI. https://www.nti.org/learn/treaties-and-regimes/proposed-nuclear-weapons-convention-nwc/.

NAPF (Nuclear Age Peace Foundation). 2017. "Julius Robert Oppenheimer". *Nuclear Files*. https://www.nuclearfiles.org/menu/library/biographies/bio_oppenheimer-julius.htm.

Ozdogan, M., A. Robock, and C. Kucharik. 2013. "Impacts of a Nuclear War in South Asia on Soybean and Maize Production in the Midwest United States." *Climatic Change* 116 (2): 373–387.

Paniagua, I., E. Crespin, A. Guardado, and A. Mauricio. 2005. "Wounds Caused by Firearms in El Salvador, 2003–2004: Epidemiological Issues." *Medicine, Conflict and Survival* 21 (3): 191–198. AQ22

Pugwash.org. 2017. "Joseph Rotblat". Conferences on Science and World Affairs. https://pugwash.org/history/joseph-rotblat/.

Ramana. 1999. *Bombing Bombay*

Raphael, T. J., ed. 2015. "PRI Quietly, Congress Extends a Ban on Public Radio International CDC Research on Gun Violence." *The Takeaway,* July 02.https://www.pri.org/stories/2015-07-02/quietly-congress-extends-ban-cdc-research-gun-violence.

Roberts, L., R. Lafta, R. Garfield, J. Khudhairi and G. Burnham. 2004 "Mortality Before and After the 2003 Invasion of Iraq: Cluster Sample Survey." *The Lancet* 364 (9448): 1857–1864. October.

Robock, A., L. Oman, G. L. Stenchikov, O. B. Toon, C. Bardeen, R. P. Turco. 2007. "Climatic Consequences of Regional Nuclear Conflicts." *Atmospheric Chemistry and Physics* 7 (8): 2003–2012.

Robock, A., L. Oman, and G. L. Stenchikov. 2007. "Nuclear Winter Revisited with a Modern Climate Model and Current Nuclear Arsenals: Still Catastrophic Consequences." *Journal of Geophysical Research: Atmospheres* 112 (D13): 1–14. AQ23

Ruff, T., and I. Helfand. 2012. "Humanitarian and Public Health Efforts are Needed to eradicate Nuclear Weapons." *Australian and New Zealand Journal of Public Health* 36: 303–307. July 31. doi:10.1111/j.1753-6405.2012.00890.x

Salvage, J. 2002. "Collateral Damage: The Health and Environmental Costs of War on Iraq", Medact. *Collateral Damage: The Health and Environmental Costs of War on Iraq 2003.* AQ24 London: Medact, 2003. http:// www.ippnw.org/CollateralDamage.html.

Schroder-Back, P., P. Duncan, W. Sherlaw, C. Brall, and K. Czabanowska. 2014. "Teaching Seven Principles for Public Health Ethics: Towards a Curriculum for a Short Course on Ethics in Public Health Programmes." *BMC Medical Ethics* 15 (1): 104.

Shapin, S. 2000. "Don't Let that Crybaby in here Again." *London Review of Books* 22 (17): 15–16.

Sidel, V. W. 1995. "The International Arms Trade and its Impact on Health." *British Medical Journal* 311: 1677–1680. https://bmj.bmjjournals.com/cgi/content/full/311/7021/1677.

Sidel, V. W., H. J. Geiger and B. Lown. 1962. "The Physician's Role in the Postattack Period." *New England Journal of Medicine* 266: 1137–1145.

Simons, D., and J. Maman. 2014. https://www.greenpeace.org/international/en/news/Blogs/makingwaves/marshall-islands-takes-on-the-nuclear-armed-s/blog/51393/\

Sloan, J. H., A. L. Kellermann, D. T. Reay, J. A. Ferris, T. Koepsell, F. P. Rivara, C. Rice, L. Gray, and J. LoGerfo. 1988. "Handgun Regulations, Crime, Assaults, and Homicide." *New England Journal of Medicine* 319: 1256–1262. AQ25

Solomon, F., and R. Q., eds. Marston. 1986. *The Medical Implications of Nuclear War* National Academy Press.

Toon, O., R. Turco, A. Robock, C. Bardeen, L. Oman, and G. Stenchikov. 2007. "Atmospheric Effects and Societal Consequences of Regional Scale Nuclear Conflicts and Acts of Individual Nuclear Terrorism." *Atmospheric Chemistry and Physics* 7 (8): 1973–2002.

Toon, O., A. Robock, R. Turco. 2008. 'Environmental Consequences of Nuclear War'. *Physics Today* 61 (12): 37–42.

UN. 2013a. Permanent Mission of Austria to the United Nations, Statement by President Heinz Fischer at the High Level Meeting of the General Assembly on Nuclear Disarmament, September 26. https://www.un.org/en/ga/68/meetings/nucleardisarmament/pdf/AT_en.pdf. AQ26 AQ27 AQ28

UN. 2013b. (statement by South Africa on behalf of the Humanitarian Initiative during the second session of the Preparatory Committee for the 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons) AQ29 AQ30 AQ31

UNICEF. 1996. 'Children as Zones of Peace' in *The State of the World's Children 1996*. https://www.unicef.org/sowc96/14zones.htm. AQ32 AQ33

UNODA. n.d. 'Nuclear-Weapon-Free-Zones'. Accessed https://www.un.org/disarmament/wmd/nuclear/nwfz/ AQ34 AQ35

Wiist, W. H., K. Barker, N. Arya, J. Rohde, M. Donohoe, S. White, and P. Lubens. 2013. "The Role of Public Health in the Prevention of War: Rationale and Competencies." *American Journal of Public Health* 104 (6): e34–e47. AQ36

World Federation of Public Health Associations. 2011. Armed Conflict and War. Resolution of the WFPHA General Assembly 2011 [Internet]. Geneva: WFPHA; 2011 Armed Conflict and War – Passed by the WFPHA General Assembly. World Federation of Public Health Associations. https://www.wfpha.org/tl_files/doc/resolutions/positionpapers/peaceweapon/WFPHA_War_Resolution__PC2011.pdf. AQ37

WHO (World Health Organization).1984/1987. *Effects of Nuclear War on Health and Health Services*. Geneva: WHO.

WHO (World Health Organization). 2001. Interpretation of WHO's Agreement with the International Atomic Energy Agency (IAEA). WHO. https://www.who.int/ionizing_radiation/pub_meet/statement-iaea/en/.

WHO (World Health Organization). 2002. *World Report on Violence and Health*. Geneva: WHO. AQ38

WHO (World Health Organization). 2008. Coleman C. H, Bouesseau M. C, Reis A. "The Contribution of Ethics to Public Health." *Bulletin of the World Health Organization* 86 (8): 577–656.

WHO (World Health Organization). 2017. "Global Status Report on Violence Prevention 2014." *World Health Organization*. https://www.who.int/violence_injury_prevention/violence/status_report/2014/report/report/en/ https://www.who.int/violence_injury_prevention/violence/world_report/en/.

WMA (World Medical Association). 2017 "WMA Calls on Governments to Ban and Eliminate Nuclear Weapons." *World Medical Journal* 62 (3): 95. January 03. https://www.wma.net/wp-content/uploads/2017/03/wmj201603.pdf AQ40

Xia, L., and A. Robock. 2013. "Impacts of a Nuclear War in South Asia on Rice Production in Mainland China." *Climatic Change* 116 (2): 357–372. AQ41 AQ42 AQ43