The Growing Risk of Nuclear War

After the end of the Cold War the intense military rivalry between the Soviet Union and the United States/NATO was replaced by a much more cooperative relationship, and fears of war between the nuclear superpowers faded. As recently as the 2014 US Quadrennial Defence Review, conflict between the two former adversaries was not considered a realistic possibility [1].

Unfortunately, relations between Russia and the US/NATO have deteriorated dramatically since then. In the Syrian and Ukrainian wars, the two have supported opposing sides, raising the possibility of open military conflict and fears that such conflict could escalate to nuclear war.

Over the past two years, both sides have engaged in nuclear sabre rattling that is reminiscent of the worst periods of the Cold War. Speaking about the conflict in Ukraine in August 2014, Russian President Vladimir Putin warned “it is better not to come against Russia as regards a possible armed conflict … I want to remind you that Russia is one of the most powerful nuclear nations” [2]. In the months following the Russian annexation of Crimea, the European Leadership Network (ELN) documented a large increase in incidents involving close encounters between nuclear capable NATO and Russian military forces. A report issued by the ELN concluded, “These events add up to a highly disturbing picture of violations of national airspace, emergency scrambles, narrowly avoided mid-air collisions, close encounters at sea, simulated attack runs and other dangerous actions happening on a regular basis over a very wide geographical area” [3]. Further, both sides have conducted large scale military exercises in Europe, leading the ELN to conclude, “Russia is preparing for a conflict with NATO, and NATO is preparing for a possible confrontation with Russia” [4]. The danger inherent in this situation is magnified by the current Russian military doctrine of “nuclear de-escalation”. Rather than seeing nuclear weapons purely as a deterrent to nuclear attack, this doctrine embraces “the idea that, if Russia were faced with a large-scale conventional attack that exceeded its capacity for defence, it might respond with a limited nuclear strike” in order to force the other side to quickly end the conflict and return to the status quo ante” [5]. US/NATO military planning has always envisioned possible first use of nuclear weapons in the face of a Soviet/Russian conventional attack in Europe.

In this setting prominent leaders on both sides have expressed alarm about the growing danger of nuclear war.

Speaking in January, when the Bulletin of the Atomic Scientists announced that its Doomsday Clock would remain at three minutes to midnight, former US Secretary of Defence William Perry stated, "The danger of a nuclear catastrophe today, in my judgment is greater that it was during the Cold War … and yet our policies simply do not reflect those dangers" [6]. His assessment was echoed two months later by Igor Ivanov, Russian Foreign Minister from 1998 to 2004. Speaking in Brussels on March 18, Ivanov warned that, “The risk of confrontation with the use of nuclear weapons in Europe is higher than in the 1980’s” [7]. The increased tensions between the US and Russia have been matched by a similar escalation in the danger of nuclear war in South Asia.

Since the nuclear weapon tests of May 1998 by India and then Pakistan, the two states have expanded many-fold their respective nuclear weapon and fissile material stockpiles, and undertaken extensive development and testing of a diverse array of ballistic and cruise missiles (with ranges from 60 to 5000 km) to acquire the ability to deploy and launch nuclear weapons from the air,

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from land, and from submarines at sea. They have put in place command and control systems and doctrines that involve, in the case of Pakistan, first use of nuclear weapons in a conflict and, in the case of India, massive retaliatory strikes against population centres [8–10].

In May–July 1999, the two countries fought a war which apparently included mobilization of nuclear weapons by Pakistan, making it the most significant military conflict between two nuclear armed states [11]. They also went through a major military crisis (December 2001 to June 2002) triggered by an attack on India’s parliament by Islamist militants believed in India to be backed by Pakistan, which included the two countries moving a combined total of over half a million troops to their border [12]. The slow pace of Indian deployment and inconclusive outcome of the stand-off led India’s army to begin planning and training for a more decisive and rapid conventional attack on Pakistan [13]. Pakistan began testing a short-range truck-mounted mobile missile to deliver low-yield nuclear weapons on the battlefield [14]. This latter development has increased long-standing international concerns about the security of nuclear weapons and fissile materials in Pakistan given the large-scale and frequent Islamist militant attacks on military targets in the country and the ideological polarization within the armed forces and broader society associated with the rise of hard-line Islamist political groups over the past three decades [15].

Potential triggers for armed conflict between Pakistan and India include another major attack on India by Islamist militant groups like the one in Mumbai in November 2008 that was linked to intelligence agencies in Pakistan [16]. A second possible trigger is the recurring artillery exchanges along the line of control in Kashmir, and occasionally the international border between Pakistan and India, which often claim significant military and civilian casualties [17].

In April 2016, at the conclusion of the Nuclear Security Summit, the White House Press secretary expressed concern about, “the risk that a conventional conflict between India and Pakistan could escalate to include the use of nuclear weapons” [18]. Should Pakistan use nuclear weapons against Indian conventional forces in such a situation, Indian nuclear doctrine calls for massive retaliation directed at Pakistani cities and Pakistan has threatened to respond in kind.

With Pakistan building ever closer military and economic ties to China, and India becoming a strategic partner of the United States, such a future South Asian conflict may quickly take on a global dimension given the increasingly tense nature of the great power rivalry between China and the US [20].

North Korea has a track record of repeatedly threatening the use of nuclear weapons; for example, in March 2016 it warned it would make a “pre-emptive and offensive nuclear strike” in response to joint US-South Korean military exercises [21]. It is capable of enriching uranium and producing weapons-grade plutonium and has deployed short- and medium-range ballistic missiles as well as testing long-range missiles [22].

**Unintended Use of Nuclear Weapons**

While these growing tensions amongst nuclear armed states could lead to the deliberate use of nuclear weapons, there is also the continuing danger that they could trigger the unintended or accidental use of these weapons.

There have been at least five occasions since 1979 when either Washington or Moscow prepared to launch nuclear weapons in the mistaken belief that the other side had already launched a nuclear attack or was preparing to do so [23]. In 1979 and again in 1980 computer errors in the US caused American radar systems to display, incorrectly, incoming Soviet missiles on their monitors. In September 1983, Soviet military radar incorrectly reported a NATO attack in progress. In November of that year the Soviet leadership incorrectly concluded that a NATO military exercise was the cover for an actual attack that was about to be launched. On January 25, 1995, a full 5 years after the end of the Cold War, Russian military radar incorrectly identified a Norwegian Black Brant XII rocket launched to study the aurora borealis as a Trident missile aimed at Moscow.

In each of these situations preparations for a counterstrike were initiated and nuclear war was averted by minutes.

The danger of this kind of mistake occurring again is amplified by current deficiencies in Russian radar warning systems. Russia has no space-based satellite early warning systems to alert them to the launch of nuclear-armed ballistic missiles from the ocean, so their warning time could be as short as 10 to 15 minutes. The only way for Russia to guarantee the ability to launch its forces before they are destroyed by a pre-emptive attack would be to pre-delegate launch authority to field commanders. Under these conditions, the time pressure to make a launch decision could greatly increase the chance of an accidental launch, especially if a computer error caused a false warning of attack during a crisis [24]. Recently, military leaders have begun to warn of a new threat that might cause the unintended launch of nuclear weapons: cyberterrorism. In a June 2015 speech, retired Marine Gen. James Cartwright, former head of the US Strategic Command, warned that it might be possible for terrorists to hack into Russian or American command and control systems and launch one or more nuclear missiles, a launch which would have a high probability of triggering a
wider nuclear conflict. This danger is intensified by the continued US and Russian policy of maintaining their missiles on hair trigger alert, fully prepared for use and simply awaiting an order to launch [25]. There is also extensive evidence that individuals with responsibility for nuclear weapons have breached safety regulations. In 2003, for example, half of the US Air Force units responsible for nuclear weapons failed their safety inspections. In 2007 six cruise missiles armed with nuclear warheads were mistakenly loaded onto a B-52 bomber which sat on the tarmac overnight without armed guards before taking off and flying 1500 miles in violation of regulations which prohibit transportation of nuclear weapons by air over the USA [26].

### Nuclear Weapons Modernization

The nuclear danger is amplified further by the extensive plans of all nine nuclear armed states to enhance their nuclear arsenals.

Although the world’s inventory of nuclear weapons has declined significantly over the past two-and-a-half decades, from around 58,300 warheads in 1991, there remain roughly 15,375 warheads today of which 4,200 are deployed with operational forces. Nearly 1,800 warheads are on alert and ready for use on short notice [27]. (Figure)

While Russia, the US, and Britain continue to reduce their inventories, the pace of reduction has slowed compared with the past two decades. In fact, four of the world’s nuclear-armed states (China, Pakistan, India and North Korea) are increasing their nuclear arsenals.

There are currently no negotiations between nuclear-armed states about reducing warhead inventories or curtailing operations and modernizations. Instead, there are signs that the deepening crises in Europe and the

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**Figure.** Estimated Global Nuclear Warhead Inventories, 2016

South China Sea are causing nuclear-armed states to increase the role of their nuclear forces. Instead of moving decisively toward deep cuts of their nuclear arsenals and making plans for the eventual elimination of nuclear weapons, the nuclear-armed states are reaffirming the importance of nuclear weapons and are carrying out extensive and costly modernizations of their nuclear arsenals [28]. (see table)

The scope of these modernization plans has led observers to characterize them as the beginning of a new arms race and a new Cold War [29].

### The Health Consequences of Nuclear War

Given the growing danger of nuclear war, it is important to consider the health consequences of such a conflict.

The acute effects of nuclear weapons are well described in previous major reports by WHO and the US Institute of Medicine [30,31]. While there have been important developments regarding ionising radiation health effects in recent decades, it is in relation to the impacts of nuclear war on climate, agriculture and nutrition that scientific advances of the greatest moment have been made in the past decade, and these are therefore our focus here. As a result of these, we have come to understand that it is not just large scale nuclear war between the US and Russia that poses a global threat. A series of studies have shown that localized, regional nuclear war will also have catastrophic effects worldwide.

We undertook a literature search using the Web of Science database Topic Search function, on 1 April 2016, covering documents in English published from 2005 to 2016, using the search strategy: ("Nuclear Weapon" OR "nuclear war" OR "atomic weapon" OR "atomic war" OR "nuclear conflict") and (Climate OR "Climate Change" OR environment* OR "Ozone Depletion" OR ozone OR Starvation OR famine OR Agriculture* OR crop* OR Food)).

The scenario that has been studied most frequently is a limited nuclear war between India and Pakistan involving 100 Hiroshima sized warheads, small by modern standards, targeted on urban centers. (This is a deliberate underestimate of the full potential of war in South Asia: the combined arsenals
### Table. Modernization Activities of the Nine Nuclear-armed States

**Russia**
- Replacing all Soviet-era SS-18, SS-19 and SS-25 intercontinental ballistic missiles (ICBMs) by the early-2020s with different versions of the SS-27 and a new “heavy” silo-based ICBM.
- Building eight new ballistic missile submarines (SSBNs) with the new SS-N-32 (Bulava) missile to replace eight operational Soviet-era Delta-class SSBNs and their missiles.
- Upgrading its old Tu-160 (Blackjack) and Tu-95MS (Bear) bombers so they can continue to operate until a new bomber can replace them sometime in the 2020s.
- Gradually replacing the old AS-15 air-launched cruise missile (ALCM) with a new ALCM known as the Kh-102.
- Modernizing some of its non-strategic nuclear forces, replacing the old SS-21 short-range ballistic missile (SRBM) with the SS-26 (Iskander), replacing the old SS-N-21 sea-launched land-attack cruise missile (SLCM) with the SS-N-30A (Kalibr), and replacing the old Su-24 (Fencer) fighter-bomber with the Su-34 (Fullback).

**United States**
- Building a new fleet of 12 SSBNs to replace the current 14 SSBNs. The new submarines will carry an improved version of the Trident II D5 sea-launched ballistic missile (SLBM) with new guidance system and enhanced warheads.
- Modernizing its B-2 and B-52 bombers and developing the new B-21 stealth-bomber to replace the B-52s (and B-1s) from the late-2020s.
- Developing a new guided nuclear bomb (B61-12) with increased accuracy, and a new ALCM with longer range and enhanced warhead.
- Designing a new ICBM with enhanced warheads to replace the current Minuteman III ICBM by 2030.
- Modernizing its non-strategic nuclear forces by replacing F-16s (and eventually F-15E) fighter-bombers with the F-35A stealthy fighter-bomber that will be carrying the new B61-12 guided nuclear bomb.

**China**
- Replacing old liquid-fuel land-based missiles with DF-26 and DF-31A solid-fuel missiles on road-mobile launchers.
- Equipping some of its missiles with multiple warheads.
- Deploying a small fleet of Jin-class SSBNs with the new JL-2 SLCBM.

**France**
- Modernizing its SSBN fleet with the new M51 SLBM that will soon receive a new warhead.
- Arming its bomber force with ALCMs.
- Replacing Mirage 2000N aircraft with Rafale which will be armed with a new ALCM.

**United Kingdom**
- Developing a new SSBN class to replace the current Vanguard-class SSBNs which will carry the life-extended Trident II D5 with a new guidance system.
- Equipping current SLBMs with enhanced warheads.

**Pakistan**
- Deploying new and longer-range Shaheen-III ballistic missiles, Ra’ad ALCMs, Babur ground-launched cruise missiles, and developing a nuclear SLCM.
- Deploying a tactical nuclear weapon, the 60-kilometer NASR missile.
- Increasing production of fissile material for additional warheads.

**India**
- Deploying and developing longer-range ballistic missiles that can target all of Pakistan and China, including several new versions of the Agni missile family.
- Conducting sea-trials of its first SSBN, which will carry new types of SLBMs.
- Building new reactors that can produce plutonium for additional warheads and expanding uranium enrichment capacity.

**Israel**
- Modernizing its Jericho ballistic missiles and probably also its fighter-bombers.
- Possibly equipping its new German-built Dolphin-class submarines with a nuclear cruise missile.

**North Korea**
- Deploying two new ballistic missiles (Musudan and Hwasong-13) that could potentially in the future be equipped with weaponized versions of the nuclear devices it has tested.
- Developing a new longer-range missile.
of India and Pakistan actually contain more than 220 nuclear warheads.) The direct effects in South Asia are catastrophic. Some 20 million people would die in the first week from the direct effects of the explosions, fire and local radiation [32].

The global consequences—global climate disruption and resultant famine—would be far more devastating. The fires caused by these nuclear weapons would loft 6.5 million tons of soot into the upper atmosphere. The impact of this soot has been examined by three teams of climate scientists using three different climate models and making the conservative assumption that only 5 million tons of soot are injected into the atmosphere [33–35]. Each model shows significant drops in average surface temperature and average precipitation across the globe with the effects lasting for more than a decade. The most sophisticated and recent model shows the most persistent declines in temperature and precipitation, which have not yet returned to baseline after 26 years, as long as the model was run. While the fuel density of modern cities varies, there is nothing specific to India/Pakistan about such a scenario. Nuclear weapons are extremely efficient at igniting, over large areas, simultaneous fires which rapidly coalesce and inject large volumes of soot and smoke into the stratosphere.

This climate disruption would in turn have profoundly negative impact on food production. The maize crop in the US, the world’s largest producer, would decline an average of 12% over a full decade [36]. In China, the world’s largest producer of grain, middle season rice would decline by 17% over a full decade, maize by 16%, and winter wheat, by a truly catastrophic 31% [37].

Under current conditions, adequate human nutrition cannot be sustained in the face of declines of food production of this magnitude. Total world grain reserves in January 2016 amounted to only 84 days of global consumption, and would not begin to offset the shortfall over a full decade [38]. Furthermore, there are currently 795 million people who are already undernourished at baseline [39]. There are also some 300 million people who enjoy adequate nutrition today, but live in countries highly dependent on food imports which would probably not be available as grain exporting countries suspended exports to feed their own people. In addition, there are nearly a billion people in China with incomes of $5 a day or less who are adequately fed today, but who have shared little in China’s growing prosperity over the last several decades. All of these people, around two billion, would be at risk under the potential famine conditions that would result from this limited, regional nuclear war [40]. Large scale war between the US and Russia would be far worse. In early 2016, Russia and the US were estimated to possess 7300 and 6970 nuclear warheads respectively, 93% of the global total of 15,375. Under the provisions of the New START treaty, each of these countries will retain some 1550 strategic (long range) nuclear warheads when the Treaty is fully implemented in 2018. Most of these weapons are 10 to 50 times more powerful than the bombs which destroyed Hiroshima [41]. A 2002 study showed that if just 300 of the weapons in the Russian arsenal hit urban targets in the US, 75 to 100 million people would die in the first half hour from the firestorms and explosions [42]. This attack would also destroy most of the infrastructure—the electric grid, computer, internet, banking and public health systems, food distribution networks—needed to support the rest of the population, most of whom would succumb to exposure, starvation and epidemic disease in the months following. The US counterattack would be expected to cause the same level of destruction in Russia, and if NATO were involved in the conflict, Canada and much of Europe would face similar destruction.

These direct effects are only part of the story, however. As is true for a limited war in South Asia, the global climate effects would be far worse. A war involving only the strategic weapons that will still be deployed when New START is fully implemented would put some 150 million tons of soot in the upper atmosphere, and drop temperatures around the world by 8°C. In the interior regions of North America and Eurasia, temperatures would fall by 25 to 30°C. These conditions would persist for more than a decade. Temperatures on Earth have not been that cold since the last ice age. In the temperate regions of the Northern Hemisphere, the temperature would fall below freezing for some portion of every day for at least two years [43]. Under these conditions food production would stop and the vast majority of the human race would starve.

Efforts to Eliminate Nuclear Weapons

Understanding of the unprecedented existential threat posed by nuclear weapons was widely recognized in the very first resolution of the United Nations General Assembly in January 1946, calling for the elimination of atomic weapons [44]. The preamble of the 1970 nuclear Non-Proliferation Treaty (NPT) opens: “Considering the devastation that would be visited upon all mankind by a nuclear war and the consequent need to make every effort to avert the danger of such a war…” [45]. Yet for most of the past 71 years, the shared interests of humanity, based on the real consequences of any use of nuclear weapons, have been sidelined by the perceived interests of the 9 governments that possess and threaten use of nuclear weapons, which have dictated the pace and extent of nuclear arms control and disarmament. However, the obligation to pursue effective measures towards nuclear disarmament is a shared responsibility of all 190 NPT signatory states, and the International Court of Justice in its 1996 Advisory Opinion on nuclear weapons unanimously ruled that
there exists an obligation not only to pursue in good faith, but to bring to a conclusion, negotiations leading to nuclear disarmament [46].

The contemporary ‘Humanitarian Initiative’ on nuclear weapons began with International Committee of the Red Cross (ICRC) president Jacob Kellenberger informing the Geneva Diplomatic Corps in 2010 that the world’s largest humanitarian organization would make elimination of nuclear weapons – something it first called for on 5 September 1945 – a renewed priority [47]. A few weeks later, the five yearly 2010 NPT Review Conference outcome document referred for the first time to “deep concern about the catastrophic consequences of any use of nuclear weapons” [48]. In 2011, the Council of Delegates, the highest governing body of the Red Cross/Red Crescent Movement, called on all states “to ensure that nuclear weapons are never again used”, and “to pursue in good faith and conclude with urgency and determination negotiations to prohibit the use of and completely eliminate nuclear weapons through a legally binding international agreement, based on existing commitments and international obligations” [49]. A special issue of the Movement’s flagship journal, the International Review of the Red Cross, “The human costs of nuclear weapons”, was recently published.

Beginning in 2012, at every NPT meeting and UN General Assembly (UNGA), a growing number of states, from 16 in 2012 to 144 in 2015, have supported resolutions affirming the centrality of humanitarian considerations in advancing nuclear disarmament, and the need to prevent use of nuclear weapons under any circumstances [50]. In 2013 and 2014 three successive fact-based international conferences on the Humanitarian Impact of Nuclear Weapons were held in Norway [51], Mexico [52] and Austria [53], the last with participation of 146 states. Remarkably, 68 years into the nuclear age, these were the first ever international governmental meetings dedicated to the humanitarian impacts of nuclear weapons. There was no significant disagreement at these conferences regarding the extensive expert evidence presented, leading to the conclusions 1) that any use of nuclear weapons would be catastrophic; 2) that no effective humanitarian response was possible to even a single nuclear detonation in an urban centre; 3) that the risk of nuclear weapons use had previously been underestimated, is growing, and exists as long as the weapons do; and 4) that there is a legal gap for nuclear weapons, in that the most destructive and indiscriminate of all weapons are the only weapon of mass destruction not yet explicitly prohibited under international law [54]. At the end of the Vienna conference, the Austrian government issued a pledge “to cooperate with all relevant stakeholders … to stigmatize, prohibit and eliminate nuclear weapons in light of their unacceptable humanitarian consequences and associated risks”; to “fill the legal gap for the prohibition and elimination of nuclear weapons” [55]. As of 20 March 2016, 127 states have endorsed this Humanitarian Pledge, with an additional 22 states voting in favour of a resolution bringing the Pledge to the UNGA [56].

The 2015 General Assembly also voted overwhelmingly to establish an Open Ended Working Group (OEWG) to address this legal gap, which though open to all states, was opposed and boycotted by all the nuclear-armed states. The Working Group was charged with reporting back to the 2016 UNGA on effective legal measures required to attain and maintain a world free of nuclear weapons. It “recommended with widespread support for the General Assembly to convene a conference in 2017, open to all States, with the participation and contribution of civil society, to negotiate a legally-binding instrument to prohibit nuclear weapons, leading towards their total elimination …”[57]. The Working Group’s report provided detailed suggestions on specific elements that could be included in such a treaty. This recommendation was taken forward in a resolution co-sponsored by 57 states [58] and adopted by the UNGA First Committee on 27 October 2016, with 123 States voting yes, 38 (predominantly nuclear-armed and nuclear-allied) voting no, and 16 abstentions. The full UNGA will undertake a final vote in early December 2016, and the first negotiating conference will convene in New York on 27 March 2017. A new international treaty comprehensively prohibiting nuclear weapons is thus within sight. This is increasingly seen by a substantial majority of states as the most promising and realistic step which can now be taken to progress the eradication of nuclear weapons, and the conclusion of such a treaty would constitute the most significant development in nuclear disarmament since the end of the Cold War. Treaties unequivocally prohibiting unacceptable weapons and providing for their subsequent elimination has been the approach successfully used in relation to every other kind of indiscriminate, inhumane weapon – biological, toxin [59] and chemical weapons [60], followed by antipersonnel landmines [61] and cluster munitions [62].

The Role of the Health Community

Involvement of the medical community in these efforts to eliminate nuclear weapons flows from a long history of medical and scientific concern about nuclear weapons. After the hydrogen bomb code name Castle Bravo was detonated at Bikini Atoll with a yield of around 15 megatons (millions of tons of TNT equivalent), double that predicted, there was widespread protest from many world leaders together with Albert Einstein and the Federation of American Scientists [63]. In 1957, as atmospheric testing of nuclear weapons continued unabated, an appeal from Albert Schweitzer for a ban on nuclear tests was broadcast to audiences in 50 nations and a petition initiated by Linus Pauling, 1954 Nobel laureate in Chemistry, also demand-
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ing a test ban was signed by 9000 scientists in 43 countries. Pauling was awarded the Nobel Peace Prize in 1963 for his opposition to nuclear testing. Also in 1957 the British Atomic Scientists’ Association set up a committee to assess the risks of cancer arising from the fallout from atmospheric nuclear tests, chaired by Professor Joseph Rotblat, a medical physicist (and during the 2nd World War an atomic scientist, working on the atomic bomb at Los Alamos). It concluded that for every 1 megaton exploded in the atmosphere, around 1000 people were likely to develop bone cancers, and made other estimates of the likely health consequences of atmospheric nuclear testing [64].

A series of four [65-68] influential articles appeared in the New England Journal of Medicine in 1962 describing the medical effects of a thermonuclear attack on Massachusetts, the (limited) role of the medical profession in dealing with the consequences, and the psychiatric and social aspects of civil defence. The authors, who were members of a new organization Physicians for Social Responsibility, concluded that as no effective clinical response was possible, doctors “must begin to explore a new area of preventive medicine, the prevention of thermonuclear, chemical and biological warfare”.

Negotiations on a ban on nuclear testing continued inconclusively until 1963 because of concerns about the potential to conceal clandestine tests. With evidence of widespread radioactive fallout and accumulation of strontium-90 in the deciduous teeth of children around the world, public opinion swung strongly in favour of banning atmospheric nuclear testing and the Limited Test Ban treaty was agreed in 1963, but progress towards a comprehensive treaty proved frustratingly slow.

In the early 1980s a number of reports on the health effects of nuclear weapons appeared including a BMA report of 1983 which concluded that the casualties from the detonation of a single megaton weapon would overwhelm the resources of the entire UK National Health Service [69]. The World Health Assembly adopted a resolution in 1983 including reference to nuclear weapons as “the greatest immediate threat to the health and welfare of mankind” [70]. Scientific and medical evidence that civil defence programs against nuclear war provided at best an illusion of protection led to their widespread abandonment [71]. Evidence on the catastrophic health effects of nuclear war brought by physicians to Presidents Ronald Reagan and Mikhail Gorbachev had profound effect, bringing them to declare in 1985 that “A nuclear war cannot be won and must never be fought”; to end their nuclear arms race; agree on the elimination of intermediate range nuclear missiles; and come close to an agreement to eliminate their nuclear arsenals entirely. Gorbachev wrote that without the efforts of IPPNW – awarded the Nobel Peace Prize in 1985 – these disarmament initiatives “would probably have been impossible” [72]. Given the potential for nuclear war to occur as a result of error and the lack of evidence that a planned medical response can have any perceptible impact on the outcome, it has been suggested that “support for deterrence with these weapons as a policy for national or global security appears to be incompatible with basic principles of medical ethics and international law. The primary medical responsibility under such circumstances is to participate in attempts to prevent nuclear war” [73]. New evidence about the pervasive threats to health of the detonation of even a small percentage of the world’s nuclear arsenals, together with the failure of the Non-Proliferation Treaty to prevent the retention and modernization of nuclear weapons has given impetus to a new global movement to ban nuclear weapons. The health professions therefore have a central role in advocating for the abolition of nuclear weapons, reflecting their ethical responsibility to protect health and prevent illness.

In 2007, IPPNW founded the International Campaign to Abolish Nuclear Weapons (ICAN) – a broad global campaign coalition working for a treaty banning nuclear weapons. ICAN now has 440 partner organizations in 98 countries, is the lead civil society partner for the governments hosting the Humanitarian conferences, and continues to grow as a major civil society coordinating initiative and partner for governments serious about the humanitarian imperative for nuclear disarmament.

In Moscow in October 2015, the World Medical Association General Assembly unanimously updated its Statement on Nuclear Weapons, adopted in 1998 and amended in 2008, requesting all National Medical Associations to educate their publics and governments about the health impacts of nuclear war and “to join the WMA in supporting this Declaration and to urge their respective governments to work to ban and eliminate nuclear weapons” [74].

In April 2016, the WMA joined with IPPNW, the World Federation of Public Health Associations and the International Council of Nurses, in submitting to the UN Working Group the first such united statement detailing the health and humanitarian imperative to ban and eliminate nuclear weapons [75]. All other global health progress and efforts could come to nought if we do not succeed in eradicating nuclear weapons before they are again used in war. There has never been a better opportunity nor greater need for united and effective health professional engagement to remove the most acute existential threat to global health and survival.

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WMA Calls on Governments to Ban and Eliminate Nuclear Weapons

World Medical Association (WMA)
Statement on Nuclear Weapons
Adopted 17 October 2015

The WMA Declarations of Geneva, of Helsinki and of Tokyo make clear the duties and responsibilities of the medical profession to preserve and safeguard the health of the patient and to consecrate itself to the service of humanity. The WMA considers that it has a duty to work for the elimination of nuclear weapons.

Therefore the WMA:

2.1 Condemns the development, testing, production, stockpiling, transfer, deployment, threat and use of nuclear weapons;

2.2 Requests all governments to refrain from the development, testing, production, stockpiling, transfer, deployment, threat and use of nuclear weapons and to work in good faith towards the elimination of nuclear weapons;

2.3 Advises all governments that even a limited nuclear war would bring about immense human suffering and substantial death toll together with catastrophic effects on the earth’s ecosystem, which could subsequently decrease the world’s food supply and would put a significant portion of the world’s population at risk of famine; and

2.4 Requests that all National Medical Associations join the WMA in supporting this Declaration, use available educational resources to educate the general public and to urge their respective governments to work towards the elimination of nuclear weapons.

2.5 Requests all National Medical Associations to join the WMA in supporting this Declaration and to urge their respective governments to work to ban and eliminate nuclear weapons.

The Value of Resiliency Training in Postgraduate Medical Education

Residency is a dynamic and stressful time. Trainees must continually balance their roles as both learners and clinicians within a high-stakes environment. Whether it’s hearing that first code pager, witnessing a patient death, feeling the cumulative impact of long hours and on-call responsibilities, or missing an important life event at home – every resident deals with stress.

Stress impacts physician well-being. The majority of Canadian medical residents report that work-related fatigue affects their mental health, physical health, and relationships with family and friends (Resident Doctors of Canada National Resident Survey, 2015). The overall depression rate in U.S. medical students and residents is as high as 1 in 5 [1]. Burnout, a work-related syndrome due to chronic exposure to occupational stress, is prevalent in 27–75% of residents, depending on specialty [2].

RDoC’s Resiliency Curriculum

Resiliency is the ability to recover from or adjust easily to adverse situations, and it is a critical trait for resident doctors. Training residents in resiliency skills equips them to effectively identify, cope with, and recover from challenging experiences in their personal and professional lives, while setting them up for rewarding and sustainable careers.

With content support from the Mental Health Commission of Canada and the Department of National Defence’s Road to Mental Readiness Program, Resident Doctors of Canada (RDoC) has developed a practical, skills-based resiliency curriculum to help mitigate the negative consequences of stress during residency and beyond.

The curriculum is based on the importance of promoting mental resiliency in physicians by fostering supportive and positive