THE EFFECTS OF NUCLEAR WEAPONS ON HUMAN HEALTH

ESTIMATED CASUALTIES AND DESTRUCTION CAUSED BY THE ATOMIC BOMBS DROPPED ON HIROSHIMA AND NAGASAKI IN 1945

On 6 August 1945 a 13 kiloton atomic bomb exploded over Hiroshima, Japan. This was followed on 9 August by the explosion of a 21 kiloton bomb over Nagasaki. To date, these have been the only times a nuclear weapon has been used in armed conflict. The following figures reflect the scale of the casualties and damage that resulted from the explosions.

Deaths:
- Hiroshima: 100,000 – 140,000 killed
- Nagasaki: 60,000 – 70,000 killed

Total area destroyed by heat, blast and fire:
- Hiroshima: 13 sq km (including 4 sq km completely destroyed by a firestorm)
- Nagasaki: 6.7 sq km

Impact on medical services in Hiroshima:
- 270 out of 300 doctors killed or injured
- 1,654 out of 1,780 nurses killed or injured
- 270 out of 300 doctors killed or injured

Sources:
- International Physicians for the Prevention of Nuclear War, Zero is the only option, September 10, 2007.
- The International Review of the Red Cross, Volume 65, Number 626, 1983.

THE IMMEDIATE AND LONG-TERM HEALTH CONSEQUENCES OF NUCLEAR WEAPONS

The atomic bombings of Hiroshima and Nagasaki in 1945 and medical studies conducted since that time have shown the type of immediate and long-term health consequences that can be expected in the event of even a limited use of nuclear weapons. The following describes the health effects and casualties that could be expected from only one 10 to 20 kiloton nuclear weapon (the size of the bombs that destroyed Hiroshima and Nagasaki) detonated at an altitude of 1 km above a densely populated area.

SUMMARY

Heat casualties: The earth below the epicentre of the blast would be heated to a temperature of approximately 7000°C, which would vaporize all living things in that area. Tens of thousands of those people who will not have been vaporized would be burnt, with most people suffering horrific full thickness skin burns. Severe burns could occur up to 3 km from the blast. In addition, many people looking in the direction of the explosion would suffer temporary flash blindness for up to 40 minutes or even permanent eye damage, including retinal burns and scarring affecting the visual field, from looking at the fireball with the naked eye.

Blunt injuries: The fireball and flash heat would immediately be followed by blast pressure waves travelling at supersonic speeds. People would be killed or severely injured by collapsing homes, falling buildings or flying debris,
or from being blown through the air. Injuries would include ruptured organs, compound fractures, fractured skulls and penetrating wounds. A significant number of people would be left deaf, owing to ruptured eardrums.

The accompanying firestorm: The fireball and heat would raise temperatures to such levels that many objects and structures not immediately vaporized would burn. The combination of the heat and blast would cause fuel storage tanks and flammable liquids to explode. As a result, large numbers of fires would ignite and potentially create an immense firestorm as winds and intense heat combine the individual fires. A firestorm consumes all nearby oxygen and many seeking safety in shelters above or below ground would be likely to die from asphyxiation. Those that survive above or below ground would be likely to have died from fatal burn and blast injuries. Radioactive fallout may also be carried considerable distances downwind, exposing a much larger population than that affected by blast and fire.

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Many of those who survive the heat and blast effects of a nuclear explosion would fall victim to radiation sickness in the weeks and months that follow. This unique consequence of nuclear weapons would affect persons located outside the immediate proximity of the explosion, as those close to the explosion are likely to have died from fatal burn and blast injuries. Radioactive fallout may also be carried considerable distances downwind, exposing a much larger population than that affected by blast and fire.

Many affected individuals would not be aware that they have received a potentially lethal radiation dose until days or weeks after the explosion, when the damage to their blood system would become evident from bleeding from the gums, or from uncontrolled infections or wounds that fail to heal.1

The immediate effects of radiation include:

- central nervous system dysfunction (at very high doses);
- nausea, vomiting, and diarrhoea from damage to the gastrointestinal tract, leading to potentially fatal dehydration and nutrition problems; and
- destruction of the body’s capacity to produce new blood cells, resulting in uncontrolled bleeding (because of the absence or severe reduction of platelets) and life-threatening infections (because of the absence or reduction of white blood cells).

Even if people survived the immediate dangers or exposure to radiation, they would face an increased risk of developing certain cancers, such as leukaemia and thyroid cancer. Over time, many more lives would be lost.

In Hiroshima and Nagasaki the fatalities attributed to the bombings had, by 1950, risen to 200,000 and 140,000 respectively.2 Leukaemia incidence increased during the late 1940s and reached a peak in the mid-1950s before decreasing to a lower but still elevated level. The risk of cancer of the breast, oesophagus, colon and lung also rose, particularly in people exposed to high levels of radiation.3 Even today, radiation-related illness and death are seen among the now elderly survivors.

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The medical needs of the wounded and sick in the aftermath of a nuclear bomb explosion would be enormous. An overwhelming number of people would need immediate treatment for severe and life-threatening wounds, but no such treatment or assistance would likely be available in the short term.4

The explosion of a nuclear weapon exerts a heavy toll on the medical services. In the area affected by the explosion most medical personnel would be dead or wounded and most medical facilities would be destroyed or unable to function. Any medical supplies that survived the explosion (e.g. fluids, bandages, antibiotics and pain medicines) would quickly be used up. There would be no electricity for X-ray machines or ventilators.

These consequences were highlighted by Marcel Junod, a delegate of the International Committee of the Red Cross, who was one of the first foreign doctors to arrive in Hiroshima and assess the effects of the atomic bombing. It was immediately clear that the human suffering and loss of life there were catastrophic, as was the impact of the explosion on the medical infrastructure and medical services.

As noted by Junod, and indicated in the table above, Hiroshima’s medical infrastructure was devastated by the bombing, with most of its skilled medical personnel killed or injured. Structurally, a Japanese Red Cross hospital, located 1.5 km from the epicentre, remained largely intact. However, it could no longer function as a medical facility as its equipment was unusable, a third of its staff had been killed and there was no possibility of blood transfusions, most potential donors being either dead or injured. In an improvised hospital visited by Junod patients were suffering from the effects of radiation poisoning. To use his words:

1. The extent of radiation injuries from fallout will depend on a variety of factors, such as whether the nuclear explosion takes place underground or above the surface, and whether those who receive the radiation are sheltered or not. 2. The Committee for the Compilation of Materials on Exchange Caused by the Atomic Bomb in Hiroshima and Nagasaki, Hiroshima and Nagasaki: The Physical, Medical, and Social Effects of the Atomic Bombings, 2012, p.160. 3. British Medical Association, The Medical Effects of a Nuclear War, pp. 83–88. 4. See, “Humanitarian Assistance in the Response to Nuclear Weapon Use”, ICRC Information Note, February 2013.

They need small blood transfusions at regular intervals; but there are no donors, no doctors to determine the compatibility of the blood groups; consequently, there is no treatment.”

Survivors of the atomic bombing in Hiroshima, such as this woman, were often badly burned, and many also suffered long-term health consequences.