

Select Sources From ‘The Brink’

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By **Spencer Cohen**

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The first article in the Opinion series *At the Brink* walks readers through the aftermath of a single nuclear detonation. That hypothetical scenario is based on extensive scientific research and effect modeling from the Cold War to the present, as well as conversations with experts, government officials and survivors of nuclear detonations. We have compiled a selection of those sources — detailing the humanitarian, environmental and economic effects — to help make this research more easily available to readers.

Accounts of Living Through the Bomb

The scenario describing the effects of a nuclear detonation in the article draws on several interviews with hibakusha, survivors of the atomic bombs, conducted in Hiroshima and Nagasaki, Japan, in October 2023. It also draws on key written accounts of the devastation of the two cities.

“I.C.R.C. Report on the Effects of the Atomic Bomb at Hiroshima.” International Review of the Red Cross, 2015.

John Hersey. “Hiroshima.” *The New Yorker*, 1946.

Kiyoshi Tanimoto. “My Diary Since the Atomic Catastrophe up to This Day.” Held by the Beinecke Rare Book and Manuscript Library at Yale University.

Michihiko Hachiya. "Hiroshima Diary: The Journal of a Japanese Physician, August 6-September 30, 1945." Translated by Warner Wells. University of North Carolina Press, 1955.

Tatsuichiro Akizuki. "Nagasaki 1945: The First Full-Length Eyewitness Account of the Atomic Bomb Attack on Nagasaki." Translated by Keiichi Nagata. Quartet Books, 1981.

Nuclear Explosion Simulator

To calculate the death toll and range of the effects from an atomic detonation, we consulted Alex Wellerstein's Nukemap, which draws on models published by the U.S. government during the Cold War to visualize the effects of a nuclear attack.

Understanding the Impact of Nuclear Weapons

There is a long history of academic study on the known effects of nuclear weapons in Japan and from testing around the world, as well as modeling and research conducted to anticipate the physical, economic and medical devastation of nuclear weapons. The following research informed several parts of the scenario in the article.

Charles Meade and Roger C. Molander. "Considering the Effects of a Catastrophic Terrorist Attack." RAND, 2006.

"Hiroshima and Nagasaki: The Physical, Medical and Social Effects of the Atomic Bombings." Iwanami, 1981.

Jonathan Schell. "The Fate of the Earth." Knopf, 1982.

John Borrie and Tim Caughley. "An Illusion of Safety Challenges of Nuclear Weapon Detonations for United Nations Humanitarian Coordination and Response." United Nations Institute for Disarmament Research, 2014.

M.V. Ramana. "Bombing Bombay? Effects of Nuclear Weapons and a Case Study of a Hypothetical Explosion." International Physicians for the Prevention of Nuclear War, 1999.

“Report From the Committee of Experts on Damage Scenarios Resulting From a Nuclear Weapons Attack.” Hiroshima City Council for Civil Protection, 2007.

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“Research Study on Impacts of the Use of Nuclear Weapons in Various Aspects.” Commissioned by the Ministry of Foreign Affairs of Japan, 2014.

Richard Wolfson and Ferenc Dalnoki-Veress. “The Devastating Effects of Nuclear Weapons.” The MIT Press Reader, 2022.

Samuel Glasstone and Philip J. Dolan, editors. “The Effects of Nuclear Weapons.” United States Department of Defense and United States Department of Energy, 1977.

William C. Bell and Cham E. Dallas. “Vulnerability of Populations and the Urban Health Care Systems to Nuclear Weapon Attack: Examples From Four American Cities.” International Journal of Health Geographics, 2007.

U.S. Government Planning Documents

Governments around the world have been making plans in the event of a nuclear attack since the early days of the Cold War. But those plans are not just historical documents; they are still being made today. Here are two recent documents from the Federal Emergency Management Agency that outline guidance for officials and emergency workers after a nuclear detonation. They informed parts of the reported scenario.

“Nuclear Detonation Response Guidance: Planning for the First 72 Hours.” FEMA, 2023.

“Planning Guidance for Response to a Nuclear Detonation.” FEMA, 2022.

The Effects of Nuclear Warfare on Medical Systems

Ed Holt. "Ukraine Health Care Prepares for Nuclear Disaster." *The Lancet*, 2022.

"Effects of Nuclear War on Health and Health Services." W.H.O. Management Group, 1987.

Fred Solomon and Robert Q. Marston, editors. "The Medical Implications of Nuclear War." National Academies Press, 1986.

"Medical Consequences of Radiological and Nuclear Weapons." Office of the Surgeon General, Department of the Army and U.S. Army Medical Department Center and School, 2012.

"No Place to Hide: Nuclear Weapons and the Collapse of Health Care Systems." International Campaign to Abolish Nuclear Weapons, 2022.

Timothy B. Erickson, Donell Harvin, Alexis Schmid, Gideon Loevinsohn, Anna Poriechna, Oleg Martyshyn, Kryrylo Kliukach, Meaghan Sydowski, Jonathan Strong and Sean M. Kivlehan. "Evaluation of Chemical, Biological, Radiological, Nuclear, Explosives (CBRNE) Knowledge Change and Skills Confidence Among Frontline-Line Providers During the Russia-Ukraine War." *Disaster Medicine and Public Health Preparedness*, 2023.

Radiation Sickness, Human Health and Nuclear Weapons

Since the United States dropped the atomic bombs on Hiroshima and Nagasaki in 1945, experts have studied the immediate and long-term effects of these weapons on human health.

Acute Radiation Syndrome: A Fact Sheet for Clinicians. Centers for Disease Control and Prevention.

Andrea L. DiCarlo, Carmen Maher, John L. Hick, Dan Hanfling, Nicholas Dainiak, Nelson Chao, Judith L. Bader, C. Norman Coleman and David M. Weinstock.

"Radiation Injury After a Nuclear Detonation: Medical Consequences and the

Need for Scarce Resources Allocation.” Disaster Medicine and Public Health Preparedness, 2011.

Masanori Otake and William J. Schull. “Radiation-Related Small Head Sizes Among Prenatally Exposed Atomic Bomb Survivors.” Radiation Effects Research Foundation, 1992.

Masao Tomonaga. “The Atomic Bombings of Hiroshima and Nagasaki: A Summary of the Human Consequences, 1945-2018, and Lessons for Homo Sapiens to End the Nuclear Weapon Age.” Journal for Peace and Nuclear Disarmament, 2019.

Radiation Health Effects. Radiation Effects Research Foundation.

Radiation Health Effects. U.S. Environmental Protection Agency.

The Impacts of Radiation on the Environment and Agriculture

“Chernobyl’s Legacy: Health, Environmental and Socio-Economic Impacts and Recommendations to the Governments of Belarus, the Russian Federation and Ukraine.” International Atomic Energy Agency, 2006.

Michael J. Lawrence, Holly L.J. Stemberger, Aaron J. Zolderdo, Daniel P. Struthers and Steven J. Cooke. “The Effects of Modern War and Military Activities on Biodiversity and the Environment.” Environmental Reviews, 2015.

Remus Pravalie. “Nuclear Weapons Tests and Environmental Consequences: A Global Perspective.” Ambio, 2014.

Humanitarian Aid After a Nuclear Detonation

Robin Coupland and Dominique Loyer. “International Assistance for Victims of Use of Nuclear, Radiological, Biological and Chemical Weapons: Time for a Reality Check?” International Review of the Red Cross, 2009.

Simon Bagshaw. “Population Displacement.” International Law and Policy Institute and United Nations Institute for Disarmament Research, 2014.

The Impacts of Nuclear Warfare on the Economy

“Economic Consequences of a Rad/Nuc Attack: Cleanup Standards Significantly Affect Cost.” Pacific Northwest National Laboratory, 2005.

“Economic Impacts of a Nuclear Weapon Detonation.” Article 36, 2015.

Studies on Electromagnetic Pulse (EMP)

Heather M. Pennington, Jonathan D. Rogers, Richard Schiek, Donald P. McLemore, Michael A. Dinallo, Eric Nelson and Brooke Buddemeier. “Source Region Electromagnetic Pulse Planning Considerations.” Sandia National Laboratories, 2021.

Peter Vincent Pry. “China: EMP Threat.” EMP Task Force on National and Homeland Security, 2020.

Peter Vincent Pry. “Nuclear EMP Attack Scenarios and Combined-Arms Cyber Warfare.” The Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack, 2017.

Nuclear Fallout and Black Rain

Gregory D. Spriggs, Stephanie J. Neuscamman, John S. Nasstrom and Kim B. Knight. “Fallout Cloud Regimes.” Lawrence Livermore National Laboratory, 2020.

Ritsu Sakata, Eric J. Grant, Kyoji Furukawa, Munechika Misumi, Harry Cullings, Kotaro Ozasa and Roy E. Shore. “Long-Term Effects of the Rain Exposure Shortly After the Atomic Bombings in Hiroshima and Nagasaki.” Radiation Research, 2014.

Shizuyo Sutou. “Black Rain in Hiroshima: A Critique to the Life Span Study of A-Bomb Survivors, Basis of the Linear No-Threshold Model.” Genes and Environment, 2020.

Steven L. Simon, André Bouville and Charles E. Land. “Fallout From Nuclear Weapons Tests and Cancer Risk.” American Scientist, 2006.

Famine and Nuclear Winter

One of the things that concern scientists the most about the prospect of nuclear war is the devastating impact it could have on the climate and food supplies.

Alan Robock, Lili Xia, Cheryl S. Harrison, Joshua Coupe, Owen B. Toon and Charles G. Bardeen. “Opinion: How Fear of Nuclear Winter Has Helped Save the World, So Far.” *Atmospheric Chemistry and Physics*, 2023.

Charles G. Bardeen, Douglas E. Kinnison, Owen B. Toon, Michael J. Mills, Francis Vitt, Lili Xia, Jonas Jägermeyr, Nicole S. Lovenduski, Kim J.N. Scherrer, Margot Clyne and Alan Robock. “Extreme Ozone Loss Following Nuclear War Results in Enhanced Surface Ultraviolet Radiation.” *Journal of Geophysical Research: Atmospheres*, 2021.

Lili Xia, Alan Robock, Kim Scherrer, Cheryl S. Harrison, Benjamin Leon Bodirsky, Isabelle Weindl, Jonas Jägermeyr, Charles G. Bardeen, Owen B. Toon and Ryan Heneghan. “Global Food Insecurity and Famine From Reduced Crop, Marine Fishery and Livestock Production Due to Climate Disruption From Nuclear War Soot Injection.” *Nature Food*, 2022.

Matt Bivens. “Nuclear Famine.” *International Physicians for the Prevention of Nuclear War*, 2022.

Current Nuclear Arsenals

While nations continue to invest and expand their nuclear arsenals, most are not transparent about those decisions. Nonprofit and other organizations provide expert analyses about changes in countries’ nuclear weapons numbers based on open-source information and investigation.

Hans Kristensen, Matt Korda, Eliana Johns and Kate Kohn. “Status of World Nuclear Forces.” *Federation of American Scientists*, 2023.

Heather Williams, Kelsey Hartigan, Lachlan MacKenzie and Reja Younis. “Deter and Divide: Russia’s Nuclear Rhetoric & Escalation Risks in Ukraine.” *CSIS Project on Nuclear Issues*.

Michael Kofman, Anya Fink and Jeffrey Edmonds. “Russian Strategy for Escalation Management: Evolution of Key Concepts.” Center for Naval Analyses, 2020.

Missile Threat website. C.S.I.S. Missile Defense Project.

Pavel Podvig, editor. “Menzingen Verification Experiment: Verifying the Absence of Nuclear Weapons in the Field.” United Nations Institute for Disarmament Research, 2023.

“SIPRI Yearbook 2023: Armaments, Disarmament and International Security.” Oxford University Press and Stockholm International Peace Research Institute, 2023.

William Alberque. “Russian Military Thought and Doctrine Related to Non-Strategic Nuclear Weapons: Change and Continuity.” The International Institute for Strategic Studies, 2024.

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