

Nuclear Terrorism Effects of a Nuclear Explosion in a Populated Area: New York City, New York

A Briefing Paper from International Physicians for the Prevention of Nuclear War

Here are the results of applying the Hiroshima experience to the scenario of a nuclear warhead exploding at a randomly-chosen place within the city limits of New York, using an approach based on Appendix A of the International Physicians for the Prevention of Nuclear War (IPPNW) publication, *Crude Nuclear Weapons: Proliferation and the Terrorist Threat*. These estimates are quite

conservative, at least for a scenario that does not include sufficient advance warning for effective evacuation. As explained below, if the denselypopulated center of a city is targeted, especially during peak working hours, it is possible that casualties could be several times greater than those calculated here.

The results presented here depend on the following assumptions:

1. The warhead would have approximately the same yield as the Hiroshima bomb. In the case of a "crude" nuclear device, such as might be detonated by a subnational group, this is perhaps the greatest uncertainty. An "inefficient" warhead would obviously cause proportionally fewer casualties.

2. The population density in the affected area is the average daytime population for the entire city limits. The average daytime population includes non-working city residents, residents who work in the city, and non-residents who work in the city. It excludes residents who work outside of the city. For New York, the average daytime population is 7% greater than the average residential popula-



Sample Casualties of a Nuclear Terrorist <u>Bomb Exploded in New York</u> Bands show zones of destruction from a crude Hiroshima-type explosive with a yield of 12 kilotons and little advance warning for effective evacuation. If most densely populated downtown area is ground zero, then casualties would soar.

Band (in→out)	Distance from Ground Zero	Area in Square Kilometers	Average Population	Fatality Rate	Total Deaths
A	0 - 0.5 km	0.8 sq km	6,603	98%	6,471
B	0.5 - 1.0 km	2.3 sq km	18,985	90%	17,086
C	1.0 - 1.5 km	4.0 sq km	33,017	46%	15,188
D	1.5 - 2.0 km	5.5 sq km	45,398	23%	10,441
E	2.0 - 5.0 km	65.9 sq km	543,952	2%	10,879
Total	0 - 5.0 km	78.5 sq km	647,955	9%	60,065

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tion. Considering the likelihood that a nuclear attack would be aimed at a highly populous region of the city, such as a downtown business sector, the use of the average population density to assess effects of a nuclear blast produces a conservative estimate.

3. The fatality rates (percentages of the population at each distance from the explosion who die) at various distances from ground zero would be approximately the same as those of Hiroshima. One reason to question this is that Hiroshima's air burst caused greater direct burn and blast effects than a presumably ground burst terrorist weapon would. (This is because in the case of a ground-level explosion more of the thermal radiation would be absorbed by nearby buildings than in the case of an air burst.) Offsetting this is the fact that a ground burst would generate considerably more fallout and higher radiation-related fatalities. There is also considerable uncertainty about how to apply the Hiroshima experience to a city with skyscrapers (they are less likely to burn completely than the wooden buildings of Hiroshima, but they are perhaps much more likely to have high rates of casualties from structural collapse; whether escaping from a burning wooden building is easier than surviving a collapsing and burning skyscraper is clearly uncertain). Other uncertainties include the weather at the time of the explosion (moist air will absorb more heat and thus reduce the rate of distant fires); the amount, if any, of warning time and the possibility of evacuation; and the availability and effectiveness of any emergency medical and other relief services.

Note: These Tables Only Show Fatality Rates. Based on experience from Hiroshima and Nagasaki, it is likely that approximately the same number of people would be significantly but non-fatally injured. (An extremely conservative estimate would be that the rate of non-fatal casualties would be 50% of the fatality rate.) These would be in need of medical care, and their numbers would clearly totally overwhelm any hospitals or medical institutions that survive the explosion.

Sources

Population and journey-to-work information is from the 1990 United States Census report. Land area is from the World Book Encyclopedia, 1996 edition.

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