



EDITORIAL

Beyond Bombs: The Silent Public Health Crisis of War Dust

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War • Dust • Public Health Preparation • Materials

Dear Editor,

At present, a large-scale war is unfolding in the Middle East. The parties involved have openly declared hostile positions and continue to attack one another, while other nations maintain that they are not part of the conflict. Yet is war merely about machines, aircraft, and missiles? War is undeniably a humanitarian tragedy. Yet, while the international community focuses primarily on the visible consequences *i.e.* loss of life and the collapse of health services in ongoing conflicts, another, quieter public health disaster is taking place. This crisis may persist long after the war itself has ended.

When residential buildings, hotels, and industrial areas are leveled by powerful explosions, they release vast amounts of dust containing hazardous materials, including asbestos fibers, lead, mercury, and residues from advanced munitions, whether detonated or unexploded. In addition, remnants of radioactive materials may disperse into fine particles, binding to the dust of destroyed structures. Cities flattened to the ground may symbolize military dominance, but they also generate toxic legacies for the future, affecting anyone exposed. These particles pose a persistent and life-threatening risk to civilian populations, especially to children, who inhale these toxins daily.

Research on dust particles generated from the collapse of the World Trade Center (WTC) has demonstrated substantial health risks. WTC dust was found to contain metals, asbestos, polycyclic aromatic hydrocarbons (PAHs), and persistent organic pollutants (POPs), including polychlorinated biphenyls (PCBs) and dioxins, as well as benzene [1]. Exposure to such materials has been shown to trigger inflammation throughout the respiratory tract, including the pulmonary system, and may also pose significant risks to the cardiovascular system [2, 3].

Finer particles are capable of penetrating deeper into the body, even reaching critical areas involved in maintaining the central nervous system [4]. Other reports have further indicated that such exposure may increase the risk of multiple myeloma (MM) and prostate cancer [5, 6]. Notably, these findings are based solely on dust generated from the collapse of two towers.

This risk is even greater in war zones, where buildings

and infrastructure are destroyed almost daily. Continuous exposure to dust, both indoors and outdoors, becomes unavoidable, spreading across streets, homes, shops, and even shelters. Fine particles are likely to be extensively inhaled by populations in conflict areas and may be further dispersed through human mobility as people move in response to the dynamics of war. In addition, the distribution and persistence of this dust are influenced by weather conditions across affected regions. Over time, this environmental burden may lead to a decline in lung capacity and increase population vulnerability to the resurgence of infectious diseases such as tuberculosis and pneumonia. As a result, many health conditions, including cancers, may not manifest immediately and can remain unrecognized in the short term [7]. However, in the long run, these exposures may accumulate as a significant burden on population health, with consequences that may only fully emerge two to three decades later.

War zones, therefore, function as concentrated sources of toxic dust. Allowing this situation to persist is tantamount to condemning entire populations to a future marked by prolonged suffering. We must regard this systematic environmental destruction with deep concern, as it constitutes a long-term assault on humanity itself.

Without intending to impose stereotypes on populations living in conflict zones, there is an urgent need to begin systematically developing exposure databases related to toxic dust in these settings. Existing literature on dust exposure, including studies from the World Trade Center (WTC) disaster, provides a valuable foundation for identifying key components and associated toxic elements, enabling more targeted and evidence-based response strategies.

Looking ahead, a coordinated effort from public health community is needed to characterize the chemical profile of debris in war-affected areas. This includes mapping potential contaminants and aligning them with existing toxicological and epidemiological evidence. Such an approach would allow for the early preparation of health systems, including equipping healthcare workers with the knowledge and tools to recognize, monitor, and manage both acute and long-term health effects associated with these exposures.

At the same time, establishing longitudinal surveillance systems and exposure registries will be critical for tracking health outcomes over time. These data infrastructures can support early detection of disease patterns, inform preventive interventions, and guide policy responses in the post-conflict phase. Importantly, such efforts must be conducted with sensitivity, avoiding stigmatization while prioritizing protection and care for affected populations.

While we all hope for an immediate end to war, public health preparedness cannot wait. When the conflict subsides, another, less visible “war” will emerge, the long-term battle against the health consequences of toxic dust exposure. Anticipating this reality, and acting upon it now, is essential to mitigating a future burden that would otherwise unfold silently over decades.

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Conflict of interest statement

None.

Authors' contributions

All authors equally contributed to the conception, design, execution, and manuscript preparation.

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Editor's response

Dear Dr. Fotarisman Zaluchu,

There is no doubt that the debris from explosions generates toxic and carcinogenic dust that can affect humans even after a long period of time. The most striking example is the damage suffered by the people of Hiroshima and Nagasaki.

Still on the subject of radioactive dust, it's important to remember that radionuclides such as Radon-222 are present in the soil and building materials of homes, and that this radionuclide is the second leading cause of lung cancer after smoking.

What is certainly difficult is controlling the bombed areas. Indeed, the measures that should be adopted include: closing off these areas, with only rescue workers allowed access; providing them with personal protective equipment, such as FFP3 masks; and spraying water as soon as possible to capture and precipitate fine dust particles. Furthermore, the soil should be washed, possibly with additives (such as surfactants, acids, chelating agents, etc.); covering the debris with sheets could also be helpful. Whenever possible, contaminated soil should be removed and transported to suitably equipped washing facilities. Finally, the affected area should be monitored, especially for fine particulate matter (PM10 and PM2.5).

It is clear that cleaning up a bombed area is not one of the easiest interventions to implement.

In conclusion, what is most astonishing is that humanity, who has implemented laws and technologies to protect populations from air pollution, can then compromise air quality, the quality of life, and the health of populations with the cruel instrument of war.