**PROXIMITY OF PUBLIC SCHOOLS TO TOXIC WASTE SITES**

**A VULNERABILITY INDEX**

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**Introduction**

Many chemicals, especially persistent organic pollutants, are ubiquitous in the environment and have been found globally throughout the ecosystem. Many of these chemicals are also routinely detected in humans. Starting even from infancy, babies in America are born with an average of 287 chemicals in their blood.1

There have been many spatial analysis studies researching a subset of the population’s proximity to toxic chemical exposure and population/census tract data. Typically, connections to socioeconomic status or race are analyzed. However, there does not seem to be much literature on children’s proximity to chemical waste and exposure. Schools were chosen because children are particularly vulnerable to toxic insult. Children with their developing body burden are more susceptible to environmental contaminants.

Due to a long history of military activity and industry, Massachusetts has numerous toxic waste sites. In order to approach a complete toxic profile a variety of hazardous waste sites taken from throughout the ecosystem. Many of these chemicals are also routinely detected in humans. Starting even from infancy, babies in America are now born with an average of 287 chemicals in their blood.1

All public schools in Massachusetts were analyzed for being within 250 meters of a toxic waste site. Toxic waste sites and the ensuing environmental contamination could theoretically amplify the chemical exposure to children attending schools in close proximity.

**Methodology**

First the most risky sites in terms of likely environmental contamination were chosen. Then a density map based on the location of toxic waste sites was created. All the sites were weighted equally except for Superfund sites which were more heavily weighted (x3) where red shows the highest likely risk of environmental contamination.

Toxic waste sites are one of the following MassDEP classifications: MS-1, MS-2, MS-3 or MS-4. Sites are also categorized by Toxic Release Inventory status, and certain toxic release inventory status data was included in this analysis. If no data was available the site was assessed 0.

**Results**

- 7194 total hazardous waste sites
- 196 schools within 250 meters of a toxic waste site
- 70 schools with 3 or more toxic waste sites
- 56 are elementary schools

**Discussion**

Unfortunately background chemical exposure is undeniable. The health effects are unclear but potentially widespread and could include any of the following consequences.

Exposure to endocrine disruptors, chemicals that can alter the normal functions of hormones, at critical times of development can have irreversible effects which are not necessarily immediately understood. According to the World Health Organization endocrine disrupting chemicals can cause developmental effects on the nervous system in children and attention deficit hyperactivity in children. The European Society for Paediatric Endocrinology and Pediatric Endocrine Society (American) issued a joint call to Action Statement since “it is well documented that fetuses and children may be very sensitive to exposure from exogenous hormones”.2

It has been estimated that up to 19% of cancer worldwide is a result of exposure to environmental contaminants.2 The increased risk of cancer due to environmental pollutants makes epidemiological studies “extraordinarily difficult and indicative.”3

Additional increasing prevalence of other disorders may also be associated with increased background levels of toxic exposure. Food allergies increased by 18% in children in just 10 years between 1997 and 2007.4 Allergies are an immune dysfunction, as is asthma which is also steadily increasing in the population.5 There are many hypotheses but it is yet to be clear what is causing these increases.

Girls, and boys now also, are experiencing early puberty with no clear cause.6 Hormone alteration seems likely, which we’ve already shown can cause developmental abnormalities.7 There also might be a connection with the rising rates of obesity.8 Obesity is yet another public health phenomena that does not have any definitive explanation. However, there is a new area of research into “obesogens”.9 Obesogens are environmental chemical exposures that have metabolic effects.10

The environmental contaminants from these various toxic waste sites are wide-ranging from heavy metals to persistent organic pollutants to polyaromatic hydrocarbons. It is difficult to measure the direct effects. If we have little control over our background exposures than more consideration should be taken to minimize our exposures to chemicals we can control such pesticide use, our choices for our personal care products and what we eat. Every decision, at an individual, an industry and governmental level that includes the risk of exposure to a synthetic chemical should be carefully considered especially where children are concerned.

Further research could include examining the socioeconomic status as well as the health status of the students in the schools found in close proximity of toxic waste sites. Aggregating additional pollution data, such as proximity to major roads and freeways could give a clearer picture of total environmental exposure body burden.

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**References**


