

Environmental Health Risk to Young People

Lynn R. Goldman



The body of environmental law and regulation is largely based in recognition of the link between human health and environmental conditions. Now science is learning that young, growing people may have greater vulnerabilities than adults to risks and toxins in the environment. A medical expert reviews several reasons why the young are more susceptible—and often more exposed—to air pollution, contaminants in food and water, tobacco smoke, and other hazardous substances.

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Medical science has been pursuing the connection between environmental factors and human health for just a few decades. Only a fraction of that research has specifically focused on young people, and there is much to learn. Science has revealed enough for us to offer some advice, however, on steps to protect the health and development of young people.

Health at any age depends on a number of factors, including biology (gender, age, genes, and stage of physical development), social factors, behavior, and environment, which broadly is defined as any external influence, from hazardous exposures to smoking to dietary influences. This article focuses on adverse exposures in the environment and the impact on young people's health, recognizing that many factors influence human health.

To understand a youngster's vulnerability to environmental exposures, one needs to look at biological processes that are underway with puberty—with its rapid growth and change—remaining mindful of the potential for development of lifelong problems during this formative stage of life. We also need to understand patterns of exposure to substances in the environment and hazards associated with materials to which youngsters may be exposed.

SUSCEPTIBILITY

Changes associated with puberty and the adolescent growth spurt are well known. What is less well appreciated is the potential for harm during this period. Pubertal changes are under the control of hormones, and, at least theoretically, exposures to chemicals that have hormonal properties (called endocrine disruptors) could alter this process, either advancing or delaying these changes.

Only very recently have researchers begun to assess whether exposures during adolescence affect the onset of puberty.

Some laboratory and animal studies in the United States have linked precocious puberty (abnormal early onset of puberty) to toxic exposures, but to date there are no studies to support this in people. Other environmental exposures may delay puberty. Most notably, a study from a national survey of growth in the United States found that exposure to lead in adolescent girls is associated with a delay in puberty. For girls, this is a time of rapid development of breasts and, for boys, prostate glands. Some scientists have hypothesized that small changes in development of these organs, and exposures during the time of their rapid growth, could be involved in cancer risk later in life.

Adolescence is a time of very rapid growth of bones, muscles, lungs, and organ systems. On a theoretical basis, any time of rapid growth is a time of greater vulnerability to cancer-causing agents. Very little research has been done on exposure to carcinogens in this age group. One study, of tobacco smoke, found that adults who had started smoking at a younger age had much more evidence of genetic damage in lung tissues than smokers who started later, even after adjusting for years of smoking. This is because the lung grows very rapidly during this time period.

This model suggests that it is especially important for young people to avoid exposure to carcinogens, of which there are a variety in cigarette smoke. Such exposures during this period could result in cancers later in life, though it may be difficult to directly connect these cases to the earlier exposures.

We now know that brains also go through a particularly important stage of development during adolescence and early adulthood. Modern brain imaging techniques have allowed us to see and appreciate the complex changes that are unfolding, while psychologists report that young people continue to develop in areas of executive decision making and abstract reasoning during this time.

These data have come to light only in the last decade; at this time we know very little about the impact of neurotoxic substances on these developmental stages. It has been suggested that faulty brain maturation at this stage

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of development is responsible for the development of schizophrenia; however, this is unproven and no evidence links this and other neurological conditions during this time to environmental exposures.

Young adults often are on the verge of becoming, or already have become, parents in their own right. Thus, exposures to pollutants and toxins at this time of life can have a direct impact on the lives of two generations. Such exposures can affect fertility for young men by causing changes in sperm counts and morphology.

Exposures for young women can cause the buildup of toxic materials such as lead (which accumulates in bone) or persistent organic pollutants (which accumulate in body fat). These body burdens are transferred to the fetus during pregnancy and to the infant in breast milk. Other exposures are transmitted to the fetus only when exposures occur around the time of conception and during pregnancy.

EXPOSURES

Young people's behavior is inextricably linked to patterns of environmental exposure. Worldwide there is much variability in behavior patterns, yet some universal patterns are of interest. Generally, as people emerge into adulthood, they gradually become more independent of their parents. With independence comes mobility, which often confers additional risk for injuries, such as those that occur in vehicular accidents.

Young people are vulnerable to these because often they are more impulsive and more likely to take risks, because they have less experience as drivers or cyclists, in many instances because of alcohol or drug use (which impairs judgment), and, at the younger end of the scale, because their bodies are smaller and thus more vulnerable to injury. In many parts of the world, young people emerging into adulthood also are more exposed to violence and homicide.

Other exposures in the environment, while more subtle, can be just as lethal in the long run. Air pollution can harm the lungs of young people, particularly outdoor athletes who breathe more air per minute than nonathletes. Nutrition is critical during growth spurts, and young

people's food intake can be greater than for adults. During such times, a young person would have greater exposure per body weight than an adult to contaminants in food.

Young people are more likely than older people to spend time in such institutional settings as schools, military training camps, and recreational campgrounds. Some settings have well-controlled environments; in others, there is a greater likelihood of contaminated food and drinking water (campgrounds), indoor air contaminants (as have been found in many U.S. schools), or poorly understood exposures in the environment (military service).

Young people may be involved in hobbies or pastimes that include the use of any number of potentially hazardous materials, including hunting (lead shot), art (chemicals in glues and paints), cosmetic products (fingernail glue), and automobiles and other machines (fuels, lubricants, paints, exhaust fumes). In some parts of the world, chemicals like glue and gasoline are used as substances of abuse, leading to enormous intentional (and harmful) exposures.

Young people work in large numbers worldwide. Work can be of great value to children by improving financial circumstances for them and their families, preparing them for adulthood, and encouraging initiative. All too often, however, young people are employed under hazardous conditions, depending on the emphasis on control of workplace exposures in countries. The International Labor Organization has estimated that 60 percent of working children have been exposed to hazardous conditions.

In the United States, and in much of the world, children are often engaged in farm work, particularly children who are members of farm families. Such children have been found to have high injury rates associated not only with poor judgment and greater risk taking, but also because equipment designed to be safe for adults often has poor ergonomic design for smaller people.

In developing nations, high exposure levels have been associated with working with hazardous substances such as lead and pesticides, doing outdoor work in highly polluted urban areas, and coming into contact with chemicals when scavenging reusable or recyclable materials from waste dumps. Laws that restrict certain kinds of work for the youngest children, and assure workplace safety for all people, have been most effective at preventing some of these exposures.

CONCLUSION

We know that young people often are more susceptible and more exposed to certain environmental risks. At the same time, much of the basis for concern comes from our knowledge of biology and from animal studies and not from direct observation of health effects on young people as they encounter exposures in their environments. Over the next few years this situation should change given that, worldwide, a wealth of new scientific data is emerging, both on biological changes that occur during this stage of life and on long-range impacts of environmental exposures.

In this regard, it is important that the many critical studies underway to evaluate childhood environmental exposures be continued to include adolescents and young adults. At the same time, it seems sensible to take a precautionary approach to assure that young people are protected from potentially harmful effects, for their health now and in the future, and for the health of the next generation, their children. ■

The opinions expressed in this article do not necessarily reflect the views or policies of the U.S. government.

Turn That Music Down!

Loud music may not be just annoying your parents. It could be damaging your hearing. Check out what the hearing experts say.

Both the amount of noise and the length of time you are exposed to the noise determine its ability to damage your hearing. Noise levels are measured in decibels (dB). The higher the decibel level, the louder the noise. Sounds louder than 80 decibels are considered potentially

hazardous. Examples of noise levels considered dangerous by experts are a lawnmower, a rock concert, firearms, firecrackers, headset listening systems, motorcycles, tractors, household appliances (garbage disposals, blenders, food processors/choppers, etc.), and noisy toys. All can deliver sound over 90 decibels and some up to 140 decibels. The noise chart below gives an idea of average decibel levels for everyday sounds around you.

Painful:

- 150 dB = rock music peak
- 140 dB = firearms, air raid siren, jet engine
- 130 dB = jackhammer
- 120 dB = jet plane take-off, amplified rock music at four to six feet [1.2 to 1.8 meters], car stereo, band practice

Extremely loud:

- 110 dB = rock music, model airplane
- 106 dB = timpani and bass drum rolls
- 100 dB = snowmobile, chain saw, pneumatic drill
- 90 dB = lawnmower, shop tools, truck traffic, subway

Very loud:

- 80 dB = alarm clock, busy street
- 70 dB = busy traffic, vacuum cleaner
- 60 dB = conversation, dishwasher

Moderate:

- 50 dB = moderate rainfall
- 40 dB = quiet room

Faint:

- 30 dB = whisper, quiet library

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