Sunny Start
Healthy Bodies
Healthy Minds
2012
REPORT

The State of the
Young Hoosier Child

Environmental Health Report





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Chapter 1

Introduction

Introduction

When it comes to the environment and health, children should not be treated as "little adults." Children face greater harm from environmental threats because they are still growing and developing and they behave differently than adults.

From conception through early childhood, children's bodies and brains are growing and developing rapidly. For example, the brain reaches four-fifths of its adult size by age 2, but still has not made all the internal connections needed to make sense of the world. The nervous system is still maturing. The immune system has not yet developed fully to protect the child from disease. Children's inner organs, including their reproductive organs, are also maturing throughout childhood. [1]

Because children are growing, their metabolism is higher than an adult's. On a pound-for-pound basis, children breathe more air, drink more water and eat more food than adults.[2] For example, an average newborn drinks 2.7 ounces of human milk or formula per pound each day (which would be almost 22 ounces for an 8-pound newborn). A 180-pound adult would have to drink 3.8 gallons (about 40 12-ounce cans) to equal this amount. Compared to adults, infants also have greater skin surface area that absorbs chemicals more readily. Some air pollutants within a room can concentrate near the floor, where children breathe. Therefore, children can face greater harm from polluted or contaminated air, water and food than an adult living in the same home and eating the same food. [3]

The behavior of infants and small children also exposes them to more chemicals in the environment. Children love to play in dirt and explore the world by putting everything in their mouths. Infants and children spend more time on the floor, carpets and grass, where they might be exposed to bug sprays, weed killers or lead-contaminated dust. Also, children lack the experience and thinking ability to recognize dangers in the environment.[4] Today's children spend 80-90 percent of their time indoors, making a healthy indoor environment an important key to children's overall health.[5]

Links between the Environment and Children's Health

Extensive studies have documented health problems caused by prenatal and early childhood exposure to environmental toxins. Scientists believe that the timing of exposure to a chemical can be very important. In the mother's womb, the developing fetus passes through "critical windows of exposure."[6] For example, exposure to mercury or lead during critical periods of brain and nervous system development can lead to mental retardation or life-long learning disabilities. Similar windows exist for the lungs, heart, reproductive system and other organs.[7]

Much more needs to be known about how environmental chemicals contribute to disabilities such as asthma, birth defects, attention deficit/hyperactivity disorder, autism and related diseases. These disabilities can be life-long, affecting a child's family relationships, the ability to fit into society and future ability to earn a living. A National Children's Study of 100,000 children from age 0 to 21 is underway to look at environmental exposures that might contribute to these chronic diseases.[8]

Studies of animals and children indicate that small changes in normally occurring hormones and the presence of toxic agents such as lead, mercury or polychlorinated biphenyls (PCBs) can permanently affect the developing brain, nervous system or reproductive system. Such research has been used to improve many children's lives. For example, federal and state laws, regulations and programs to reduce lead in the environment have dramatically reduced lead poisoning among U.S. children since the 1970s. If we understand how environmental factors affect children's health, we can take steps to reduce many more diseases and disorders. We may even prevent some disabilities from holding back a child's full potential.[9]

Researchers are still trying to understand how genes and environmental factors work together to influence the risk of getting a disease or affect its severity or outcome. One child exposed to a toxic substance might end up with life-long disabilities, while another shows little or no harm. Environment, behavior, genetics and diet may all play a role in the development and prevention of disease.[10]

It's impossible to completely avoid toxic chemicals in the environment. New technologies, world population growth and appetites for consumer products have led to thousands of new products and chemicals. During the past 50 years, researchers have created more than 80,000 man-made chemical compounds, and many of them are used in common household products with little or no testing for human health effects. Each year, the U.S. Environmental Protection Agency receives 2,000–3,000 new chemicals for review. Of high-volume chemicals now in use, 43 percent have been tested for potential human toxicity, and just 7 percent have been studied for possible effects on child development. [11]

Even naturally occurring substances, such as lead and mercury, can harm our children. Lead and mercury became a greater threat to children in the 20th century because we unearthed them for use in consumer products, such as leaded gasoline, lead-based paint and mercury-based thermometers, thermostats and electrical switches. Since the 1970s, U.S. environmental laws have helped reduce lead and mercury in these consumer products. Mercury is also found in coal, and is released into the environment when we burn coal to make electricity. Federal regulations adopted in 2011 will reduce mercury emitted by power plants.

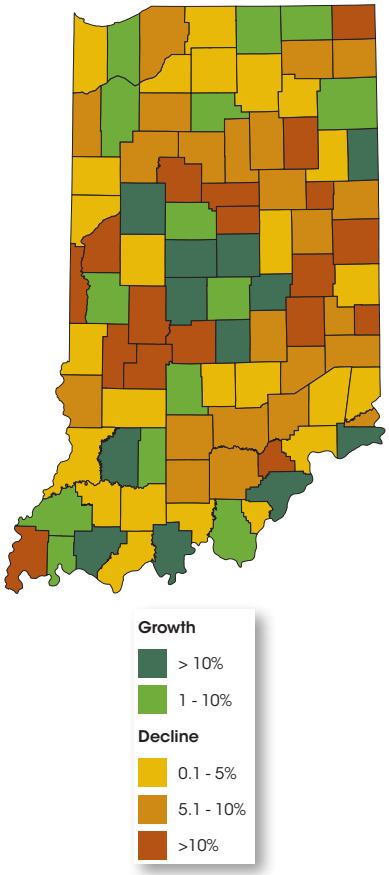
Lead, mercury, herbicides, insecticides, toxic air pollutants, and other harmful chemicals are commonplace in the modern world – easily found in our homes, schools, indoor and outdoor air, and in consumer products we use every day.[12] **This report seeks to document what we know – and don't know – about the environment in which Indiana's young children grow, play and learn. It also seeks to give parents and caregivers advice on how to prevent or reduce common childhood exposures to environmental threats.**

Where Young Hoosier Children Live

According to the 2010 census, there were 434,075 children in Indiana between birth and age 4: 6.7 percent of the state population. Indiana's population of children age 0-4 grew by 2.6 percent between 2000 and 2010.

The environments in which Indiana's young children live are important for policymakers to understand. Much of the growth in the child population from 2000-10 was concentrated in a handful of large metropolitan areas, college communities and counties with large Amish populations. Only 26 of Indiana's 92 counties saw their young child population grow from 2000-2010, as shown in Figure 1-1. Counties in dark and light green saw growth in the number of children in the 0-4 age group, while counties in yellow, orange and red recorded a decline in their young child population. Table 1-1 shows the data for the 10 Indiana counties with the fastest growing young child populations from 2000-2010, and the 10 counties with the fastest decline.

Figure 1-1: County Changes in Child Population (Age 0-4), 2000-2010



Source: U.S. Census Bureau

Table 1-1: Indiana Counties Leading in Growth and Decline of Young Child Populations, 2000-2010

10 Fastest Growing Young Child Populations (Ages 0-4)			
	2000	2010	% Growth
Switzerland County	574	789	37.5
Hendricks County	7,580	10,221	34.8
Hamilton County	16,578	21,609	30.3
Tippecanoe County	8,771	11,030	25.8
Adams County	2,702	3,186	17.9
Daviess County	2,275	2,672	17.5
Hancock County	3,754	4,396	17.1
Boone County	3,354	3,925	17.0
Perry County	1,021	1,152	12.8
Johnson County	8,585	9,625	12.1
10 Fastest Declining Young Child Populations (Ages 0-4)			
	2000	2010	% Decline
Tipton County	1,013	822	-18.9
Rush County	1,245	1,031	-17.2
Blackford County	913	759	-16.9
Randolph County	1,835	1,542	-16.0
Vermillion County	1,050	893	-15.0
Fountain County	1,191	1,017	-14.6
Union County	514	441	-14.2
Steuben County	2,199	1,888	-14.1
Posey County	1,718	1,476	-14.1
Howard County	5,978	5,170	-13.5

Source: http://www.stats.indiana.edu/topic/census.asp

Table 1-2: Top 11 Counties Where Children Age 0-4 Live			
County	**2000**	**2010**	**% of IN Total**
Marion County	63,640	68,160	15.7
Lake County	34,639	33,258	7.7
Allen County	25,440	26,524	6.1
Hamilton County	16,578	21,609	5.0
St. Joseph County	18,673	17,749	4.1
Elkhart County	14,800	16,039	3.7
Vanderburgh County	10,688	11,639	2.7
Tippecanoe County	8,771	11,030	2.5
Hendricks County	7,580	10,221	2.4
Porter County	9,488	9,792	2.3
Johnson County	8,585	9,625	2.2

Source: http://www.stats.indiana.edu/topic/census.asp

In 2010, 54 percent of Indiana's young children lived in just 11 counties (Table 1-2). These counties include Indiana's largest cities (Indianapolis, Fort Wayne, Evansville, and South Bend) as well as Northwest Indiana (Lake-Porter counties), Lafayette-West Lafayette (Tippecanoe), and the largest Indianapolis suburban counties (Hamilton-Hendricks-Johnson).[13]

"Many of Indiana's rural or mid-sized communities are aging rapidly while a few metropolitan areas remain relatively young as they attract young adults and families," said Matt Kinghorn, an analyst with the Indiana Business Research Center at Indiana University's Kelley School of Business.[14]

How This Report is Organized

This report, The State of the Young Hoosier Child Environmental Health Report, gathers together a number of indicators of children's environmental health in Indiana. Most of this data has been previously published by various agencies, but never put together in a single report.

Chapter 2 reviews what we know about children's health issues that have an environmental cause or link, including birth defects, preterm and low-birthweight births, lead poisoning and cancer.

Chapter 3 looks at the air children breathe, both indoors and outdoors, and what we know about the quality of Indiana's air.

Chapter 4 looks at the water children drink, swim and play in, and where their caregivers might fish. It takes a look at where drinking water comes from and what we know about the health of Indiana's waterways.

Chapter 5 reviews information about housing and neighborhoods that children live in.

Chapter 6 looks at the quality of Indiana's child care facilities.

Chapter 7 presents key findings and recommendations from the Sunny Start Environmental Committee.

An electronic version of this document is available on-line at sunnystart.in.gov/eh. It includes links to data sources and websites where policymakers, parents and caregivers can find more information.

Sources

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[2] Pediatric Environmental Health 2009, by Rose Goldman, MD, MPH; Michael Shannon, MD, MPH; Alan Woolf, MD, MPH (New England Pediatric Environmental Health Specialty Unit) Accessed at http://www.aoec.org/pehsu/documents/pediatric_environmental_health_goldman_2009.pdf

[3] American Academy of Pediatrics, Children's Environmental Health. 3rd Edition. 2011. Chapter 3: Children's Unique Vulnerabilities to Environmental Hazards.

[4] American Academy of Pediatrics, Children's Environmental Health. 3rd Edition. 2011. Chapter 3: Children's Unique Vulnerabilities to Environmental Hazards.

[5] American Academy of Pediatrics, Children's Environmental Health. 3rd Edition. 2011. Chapter 5: Taking an Environmental History and Anticipatory Guidance.

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[7] American Academy of Pediatrics, Children's Environmental Health. 3rd Edition. 2011. Chapter 3: Children's Unique Vulnerabilities to Environmental Hazards.

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[12] American Academy of Pediatrics, Children's Environmental Health. 3rd Edition. 2011.

[13] http://www.stats.indiana.edu/topic/census.asp

[14] http://newsinfo.iu.edu/news/page/normal/18698.html

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Chapter 2

Indicators of Children's Environmental Health

Introduction

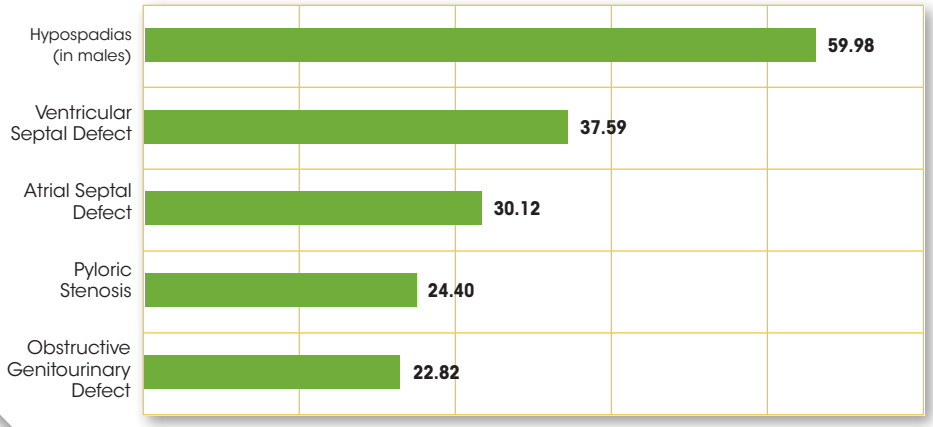
Several indicators can help us draw a picture of children's environmental health in Indiana. Some childhood illnesses, such as lead poisoning, have a clear environmental cause. Other health problems, such as birth defects or cancer, may carry an increased risk due to environmental exposures. Environmental conditions also can contribute to preterm or low-birthweight babies and asthma attacks that lead to the need for hospitalization.

This chapter looks at several childhood health problems that may have an environmental cause or link: preterm birth, birth defects, low birthweight, lead poisoning, asthma and childhood cancers.

Research identifies many factors that contribute to a child's environmental health. Illnesses described in this chapter can result from a variety of interrelated factors, including environmental exposure, genetics, diet and social factors, such as poverty and the stress that often comes with it.[1]

Also, two children exposed to the same environmental hazard may have very different outcomes. One child may be harmed for life, while the other shows little or no effect. These differences may be due to a child's age at the time of exposure, size, genetics, diet or the health of their immune system.[2]

Figure 2-1: Five Most Common Birth Defects per 10,000 Live Births, Indiana, 2004-2008



Source: Indiana State Department of Health (ISDH)

Birth Defects

The Indiana Birth Defects and Problems Registry (IBDPR) collects information to prevent birth defects and improve quality of life. The IBDPR collects information on birth defects and birth problems for all children in Indiana from birth to 3 years old (5 years old for autism and fetal alcohol syndrome). This information is used to determine how many children are born with birth defects, to develop strategies for preventing them, and to offer resources to families.

For most birth defects, scientists cannot find a single cause. Both genes and environment can play a role, but much is still unknown. One example is hypospadias, a male birth defect in which the urine "exit hole" is on the underside of the penis, instead of its tip. Some studies show a higher rate of hypospadias among boys whose mothers had higher exposure to phthalates, a type of hormone-disrupting chemical. Phthalates are added to some personal care products such as makeup and shampoo, paints, pesticides, and to plastics to make them flexible, transparent, durable or longer-lasting. According to the American Academy of Pediatrics, animal studies have linked exposure to phthalates to fetal malformations, brain

and spinal cord defects and reduced infant growth.[3] However, scientists haven't fully studied their effects on humans and the topic remains controversial.

Figure 2-1 shows the five most common birth defects recorded in Indiana from 2004-08. Of these, two are defects of the urinary tract (hypospadias in boys and blockages of the urinary tract). Two others are heart defects (ventricular and atrial septal defects). The fifth, pyloric stenosis, is a narrowing of the opening between the stomach and small intestine.

Birth defects have been linked to some environmental causes, including tobacco smoke, alcohol, certain medications, cocaine, mercury, lead, and exposure to organic solvents, found in such products as paints, varnishes, lacquers, adhesives, glues, and degreasing/cleaning agents.[4] For example, pregnant women who drink alcohol or sniff glue have a greater risk of having a baby with a birth defect.[5]

A more recent concern is the effect of hormone-disrupting chemicals on children's health. Some laboratory studies have concluded that certain chemicals, such as phthalates, disrupt animal endocrine systems, which regulate hormone levels in the body. Phthalates are used as softeners in PVC and vinyl products, including children's toys, decorating and building products, and a wide range of consumer products, including cosmetics, personal care products, wood finishes and insecticides. Scientists have found strong evidence that hormone-disrupting chemicals have affected the development and fertility of fish and wildlife. There is growing evidence of similar links between environmental exposures and human diseases of the endocrine system; however, full cause-and-effect relationships have not been established yet.[6]

What Families Need to Know

According to the March of Dimes, a woman can reduce the risk of having a child with birth defects by following this advice:

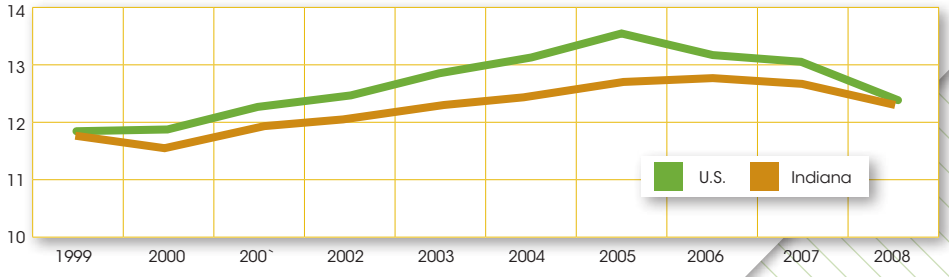
- Avoid drinking alcohol.
- Quit smoking.
- Stay away from cocaine and other illicit drugs and prescription drugs not prescribed for her.
- Fully cook all meat.
- Avoid contact with all rodents, including pet hamsters, mice and guinea pigs, and don't change a cat's litter box.
- Avoid sitting in hot tubs and saunas.
- Avoid hazardous chemicals, such as solvents (substances that dissolve other substances, like paint thinner).
- Avoid eating fish that can be high in mercury, such as shark, swordfish, king mackerel and tilefish.[7]

Hoosier women should also limit eating fish caught in some Indiana waters, due to concerns over mercury and PCBs. See the Indiana Fish Consumption Advisory for information about specific fish and waterways.[8]

Preterm Births

In Indiana, preterm birth and low birthweight are the leading causes of infant death. A full-term pregnancy lasts 40 weeks. Infants that are born at least three weeks before their due date (earlier than the 37th week) are considered preterm. Preterm babies can have trouble breathing, swallowing and sucking. They can have heart trouble and are more likely to die of sudden infant death syndrome (SIDS). When they reach school age, preterm children are also more likely to have attention and behavior problems and are more likely to need special education.[9]

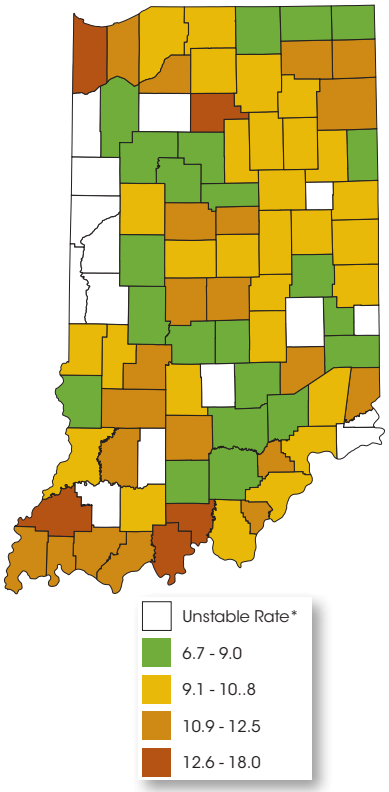
Figure 2-2: Indiana Preterm Birth Rate, 1999-2008



Source: ISDH Maternal and Child Health Division

From 1999-2008, Indiana's rate of preterm births has been somewhat higher than the U.S. rate (Figure 2-2), though the gap has narrowed in recent years.[10]

Figure 2-3: Preterm Birth Rates by County, 2005-2008 Average

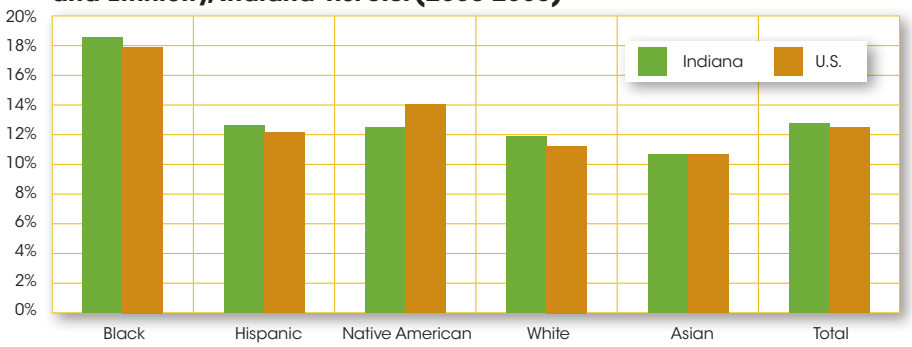


Source: ISDH
** Unstable rate due to fewer than 20 births*

Figure 2-3 shows a map of average preterm birth rates from 2003-08 by county, with counties shaded in dark red having the highest rate of preterm births and light green counties having the lowest rates.

At 18.7 percent, black infants had the highest rate of preterm births in Indiana from 2006-08 (Figure 2-4). Indiana's black infants are about 50 percent more likely than white infants to be born preterm.

Figure 2-4: Percent of Preterm Births by Race and Ethnicity, Indiana v.s. U.S. (2006-2008)



Source: March of Dimes and ISDH

What Families Need to Know

According to the March of Dimes, a number of factors put women at greater risk of preterm labor and birth.[11] These include:

- Late or no prenatal care
- Smoking
- Drinking alcohol
- Using illegal drugs
- Domestic violence, including physical, sexual or emotional abuse
- Lack of social support
- Stress
- Long working hours with long periods of standing
- Exposure to certain environmental pollutants, such as cigarette smoke, lead, insecticides, rodent poisons, weed killers, alcohols, degreasers, paint thinners and stain and varnish removers
- Exposure to the medication DES, which may affect women born between 1940 and 1971, when DES was used to prevent miscarriage, premature labor and other problems in pregnancy

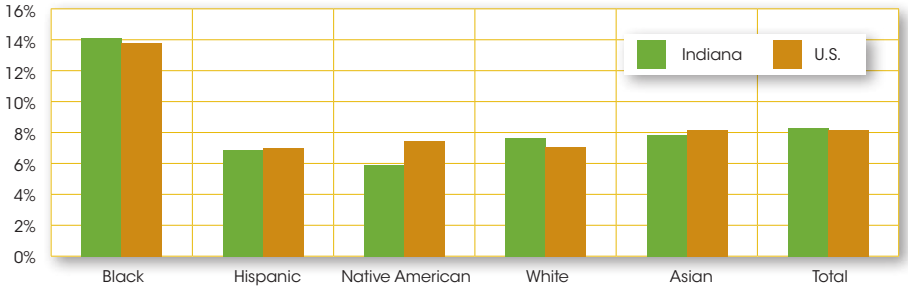
Avoiding these dangers, including environmental exposures, and providing medical care and support to pregnant women can reduce the risk of preterm birth.

Low Birthweight

Low birthweight babies can be the result of preterm births, but not all low birthweight infants are born before 37 weeks gestation.

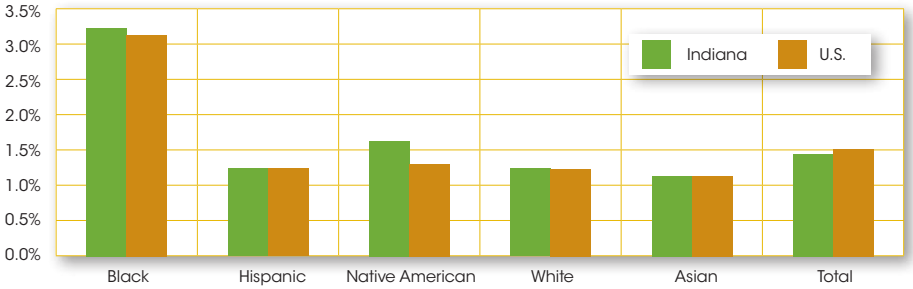
Infants weighing between three pounds, five ounces and five pounds, eight ounces at birth are considered low birthweight. Very low birthweight infants weigh three pounds, four ounces or less at birth. From 2006-2008, 8.4 percent of Indiana babies were born with a low birthweight, and 1.4 percent had a very low birthweight (Figures 2-5 and 2-6). This is comparable to national rates of 8.2 percent and 1.5 percent.

Figure 2-5: Percent of Low Birthweight Babies by Race and Ethnicity, 2006-2008 Average



Source: March of Dimes and ISDH

Figure 2-6: Percent of Very Low Birthweight Babies by Race and Ethnicity, 2006-2008 Average



Source: March of Dimes and ISDH

The environment can play a role in a baby's birthweight. Women who smoke during pregnancy have a much higher chance of delivering a baby with a low birthweight.[12]

Figures 2-5 and 2-6 show that black women in Indiana have the highest rate of infants with low or very low birthweights, and are nearly twice as likely as white women to have low birthweight infants. Among black infants from 2006-08, 14.1 percent were born with a low birthweight and 3.2 percent had a very low birthweight.

Over time, Indiana's trends for very low birthweight infants show very little change.

What Families Need to Know

The most important thing women can do to prevent low birthweight infants is to quit smoking and avoid second-hand smoke during pregnancy.

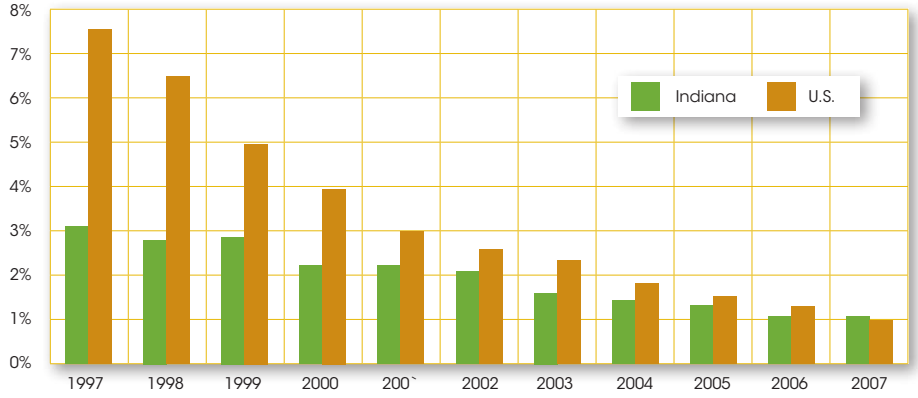
Lead Poisoning

According to the U.S. Centers for Disease Control and Prevention, lead poisoning is the number one preventable environmental cause of illness in children.

Children between the ages of 1 and 3 are at the greatest risk of lead poisoning because their nervous systems are still developing, their bodies absorb more lead than adults, and they use hand-to-mouth activity to explore their world.[13]

When lead enters the brains of children younger than 7, it can disrupt brain development at a time when the young brain is making important connections. The disruption is potentially severe and the damage is permanent. A child who has been lead poisoned can lose 4-7 IQ points, can have trouble paying attention and is more likely to need special education. Later in life, that child is less likely to graduate from high school, more likely to be incarcerated for violent crime and more likely to have a low-wage, low-skill job.[14,15,16]

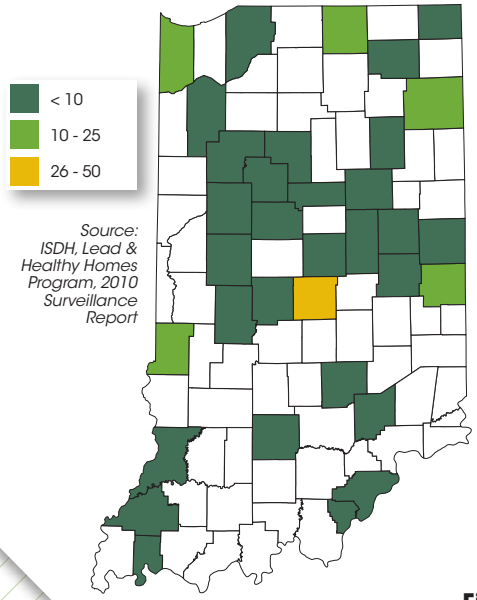
Figure 2-7: Children with Elevated Blood-Lead Levels, Indiana vs. U.S. 1997-2010



Source: ISDH, Lead & Healthy Homes Program, 2010 Surveillance Report

Lead poisoning in Indiana is defined as having 10 micrograms of lead per deciliter of blood. However, no level of lead in a child's blood has been found to be safe.[17] The U.S. Centers for Disease Control in May 2012 lowered its threshold for lead poisoning to 5 micrograms/deciliter. A national expert panel convened in November 2010 by the Centers for Disease Control and Prevention recognized that blood-lead levels as low as 5 micrograms/deciliter are associated with neurological effects in children, reduced fetal growth and lower birth weight. The CDC's response to the ACCLPP recommendations may be found at http://www.cdc.gov/nceh/lead/ACCLPP/CDC_Response_Lead_Exposure_Recs.pdf.[18]

Figure 2-8: Where Lead-Poisoned Children Were Found in Indiana, 2010



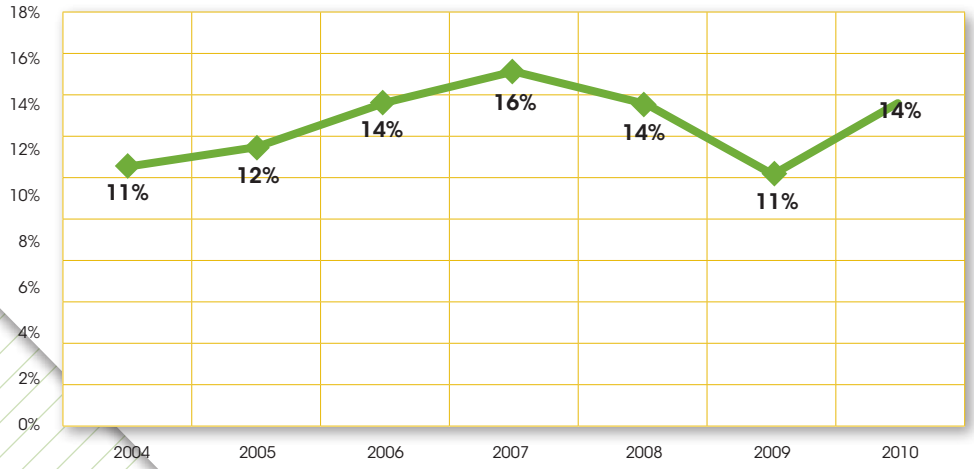
Source: ISDH, Lead & Healthy Homes Program, 2010 Surveillance Report

Rates of lead poisoning have dropped dramatically since the 1970s, when leaded gasoline and lead paint in housing were banned. Figure 2-7 shows decline since 1997 in the percentage of Indiana and U.S. children with blood-lead levels above 10 micrograms per deciliter. Data for the United States were not available for 2008-10.

Lead-based paint remains the leading source of lead poisoning today. In older homes, deteriorating lead-based paint puts children at risk of inhaling or ingesting lead paint particles. Renovation and repair projects in older homes can generate dangerous lead dust if lead-safe work practices are not followed, as required by federal law.[19]

In Indiana, 74 percent of housing units were built prior to 1980 – reflecting nearly 2 million homes that could be carrying lead-based paint. Trends show that lead poisoning is declining in Indiana and nationally (Figure 2-7), but poisoned children are still found at higher rates in counties and neighborhoods with a large percentage of older housing (Figure 2-8). According to ISDH, lead poisoning rates increase when older housing is poorly maintained and paint is allowed to deteriorate.

Figure 2-9: Percent of Medicaid-eligible Children Age 0-7 Tested for Lead Poisoning, 2004-2010



Source: ISDH Maternal and Child Health Division

Unfortunately, we know we are not identifying all Indiana children with lead poisoning because so few of them are screened. Although all Medicaid children are required to be screened at their 12-month and 24-month checkups, just 27.3 percent of Medicaid-eligible children in the 12-to-36-month age group had been screened in 2010. Children enrolled in Medicaid are considered at higher risk for lead poisoning because they often live in substandard housing. Of the Indiana children identified with elevated blood-lead levels in 2010, 63 percent were Medicaid recipients. Figure 2-9 shows lead screening rates for Indiana children age 0-7 who were Medicaid recipients.

Lead poisoning is also more likely to affect children of color. In Indiana, black children and immigrants from Asia are at highest risk (Figures 2-10 and 2-11). Although black children make up only 13.7 percent of Indiana's age 0-7 population, they comprised at least 24 percent of children with known lead poisoning in 2010. Black children are more likely to live in substandard housing and in urban areas, where soil-lead levels tend to be higher.

Higher rates of lead poisoning have been found among Burmese refugee populations living in Allen County. Investigators there found dangerous levels of lead and arsenic in folk medicines used as digestive aids for these Burmese children. For this reason, Asian children made up 22 percent of the known lead poisoning cases in Indiana in 2010, though Asian children represented only 2.2 percent of the state's 0-7 population. However, lead does not discriminate based on race, ethnicity or income status. Any child exposed to lead dust or lead-contaminated products can be poisoned.

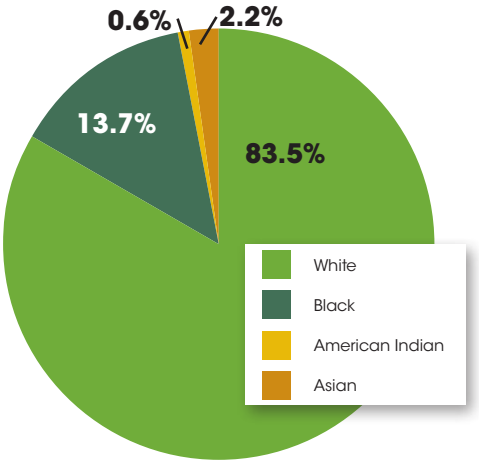


Figure 2-10: Indiana's Children Age 0-7 by Race, 2010

Source: Easy Access to Juvenile Populations: 1990-2010" Available at: http://www.ojjdp.gov/ojstatbb/ezapop/

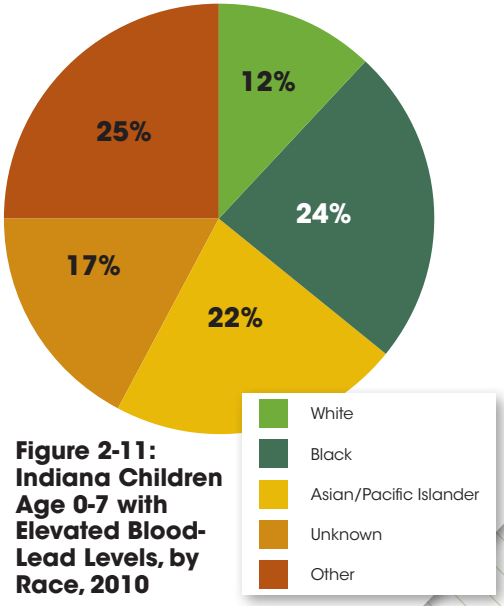


Figure 2-11: Indiana Children Age 0-7 with Elevated Blood-Lead Levels, by Race, 2010

Source: ISDH, Lead & Healthy Homes Program, 2010 Surveillance Report

What Families Need to Know

Families living in older homes and urban neighborhoods can prevent lead poisoning by following these steps:

- Get your young children tested for lead, even if they seem healthy.
- Wash children's hands, bottles, pacifiers, and toys often.
- Make sure children eat healthy, low-fat foods high in iron and calcium, such as dark greens and dairy products.
- Get your home checked for lead hazards. Your local health department may provide this service.
- Regularly clean floors, window sills, and other surfaces.
- Wipe soil off shoes before entering house.
- Talk to your landlord about fixing surfaces with peeling or chipping paint. Keep children away from paint chips.
- Avoid exposure to lead dust when remodeling or renovating (call 1-800-424-LEAD or visit www.leadsafekids.org for guidelines).
- Don't use a belt-sander, propane torch, high temperature heat gun, scraper, or sandpaper on painted surfaces that may contain lead.
- Don't try to remove lead-based paint yourself.

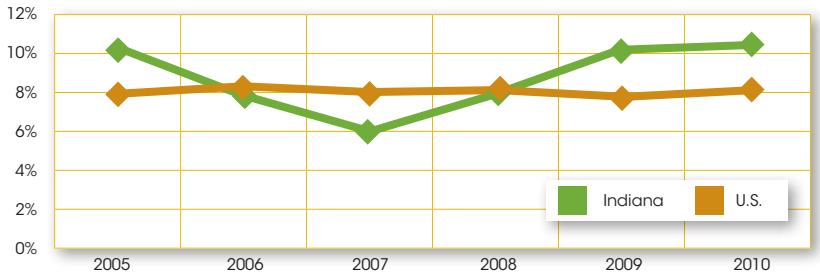
Asthma

Asthma is a chronic disease that affects the airways and lungs, and is the leading cause of hospitalization among children under age 17 in Indiana. The cause of asthma is not known, although researchers suspect a combination of genetic and environmental factors reacting with immune system deficiencies.

Many environmental factors have been identified as triggers for asthma episodes. These include pollen, mold, dust mites, tobacco smoke, household cleaners and air pollution.

According to the National Heart, Lung, and Blood Institute, most children who have asthma develop their first symptoms before 5 years of age. However, asthma in young children can be hard to diagnose. Sometimes it can be difficult to tell whether a child has asthma or another condition, such as a cold or respiratory infection.[20]

Figure 2-12: Prevalence of Lifetime Asthma Among Children Age 0-4 (2005-2010)



Source: ISDH Maternal and Child Health Division

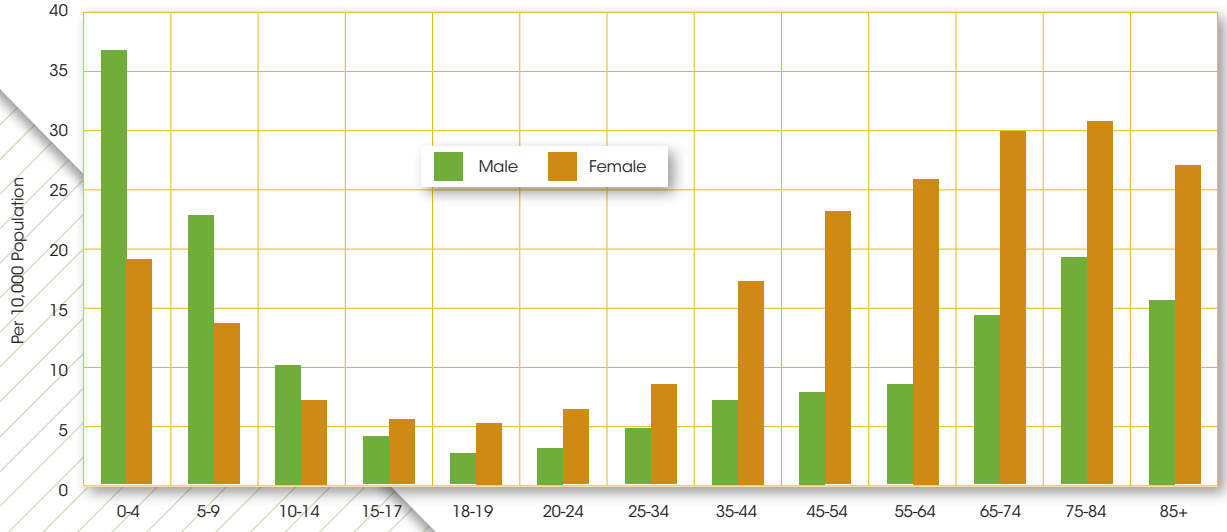
Figure 2-12 shows the percent of Indiana children age 0-4 who have ever been diagnosed with asthma in Indiana, according to an annual telephone survey conducted by the Indiana State Department of Health. Because the survey represents a sample of Indiana's population, it shows variations from year to year. Since 2007, the percent of children who have been diagnosed with asthma has risen and is now higher than national levels.[21]

Among all children age 0-17, asthma is the third leading cause of hospitalization in Indiana. Nearly 15 percent of children age 0-17 said they had been diagnosed with asthma at some point in their lives. The Indiana State Department of Health has identified children as the number one priority population for reducing the asthma burden.[22]

Asthma that is not managed properly can result in visits to the emergency department. Figure 2-14 shows the rate of emergency department visits by age and gender in 2009. Children ages 0-9 visited the emergency department due to asthma more than any other age group. Boys age 0-4 had the highest rates asthma-related emergency department visits.

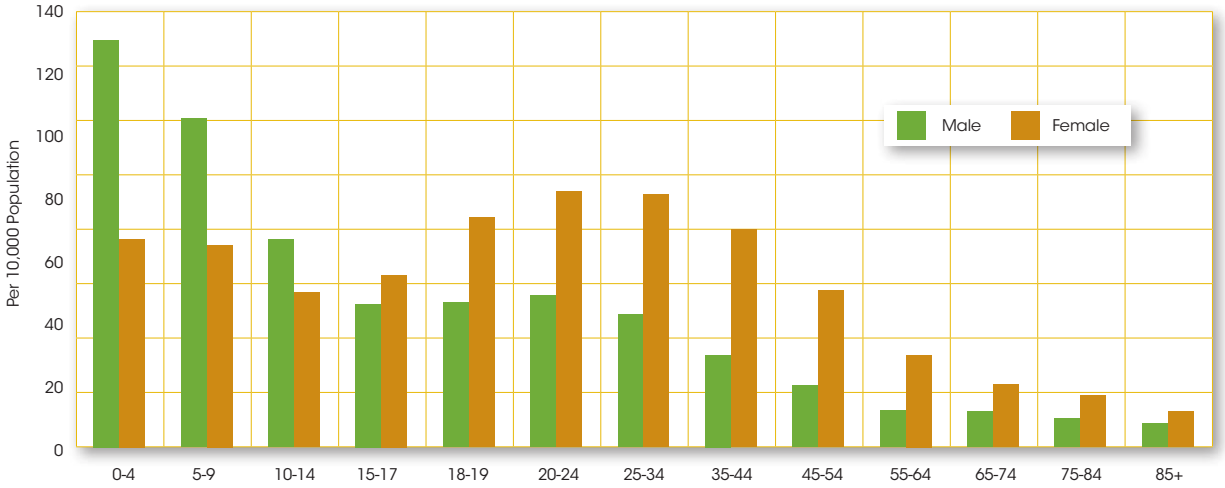
When an asthma attack is severe, sometimes the patient must be admitted to the hospital. Asthma is the third leading cause of hospitalization among children under age 17, and the highest rates of hospitalization are in male children ages 0-4. (Figure 2-13) While asthma-related

Figure 2-13: Asthma Hospitalization Rates by Age and Gender, 2009



Source: Indiana State Department of Health

Figure 2-14: Emergency Department Visits* for Asthma by Age and Gender, 2009



Source: Indiana State Department of Health

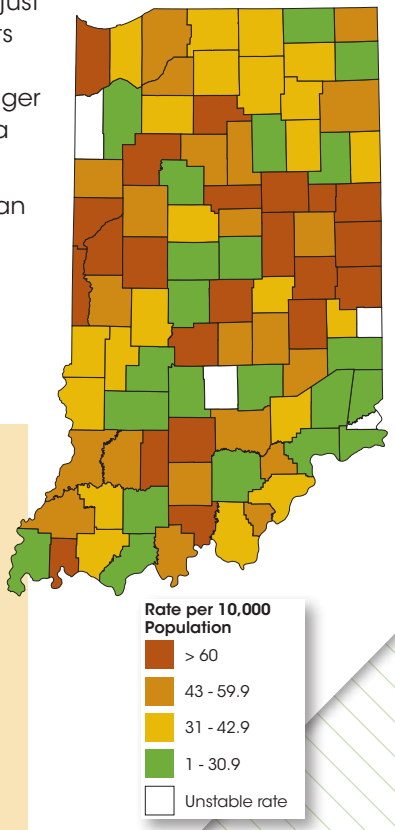
**Age-specific rate per 10,000 population*

hospitalization rates have been declining nationally since 2007, they have been increasing in Indiana.[23]

Asthma-related visits to the emergency department vary by county, as shown in Figure 2-15. The map shows all asthma-related visits for children and adults, not just those by children age 0-4. According to the State Department of Health, patients can reduce asthma attacks and emergency department visits by having an asthma management plan and by reducing things in the environment that trigger their attacks. However, patients may not always have these tools. Although data are not available for children 0-5, among Hoosier adults with asthma in 2007:

- About 69 percent said they had been taught how to recognize early signs of an asthma attack
- Only 33 percent had received an asthma action plan from a health care provider
- Only about 40 percent had been advised to change things at home, work or school to avoid asthma triggers.[24]

Figure 2-15: Asthma Emergency Department Visits per 10,000 Population by County, 2009



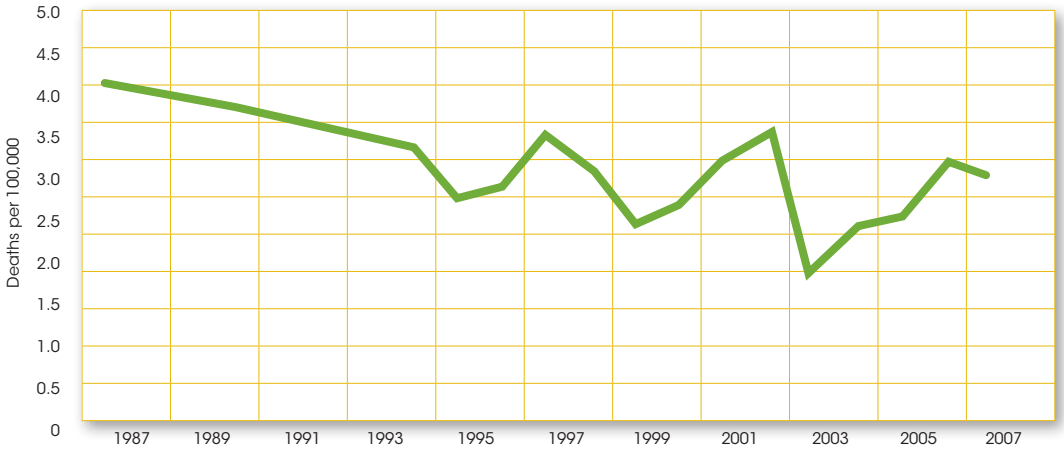
Source: Indiana State Department of Health

What Families Need to Know

The key to preventing asthma attacks is having good medical care and knowing and avoiding things that trigger an attack. Asthma triggers are different for every child. The American Lung Association offers these tips for parents of children with asthma:

- Secondhand smoke is harmful to everyone, especially children with asthma. Keep your home and car smoke-free, and try to avoid smoky public places.
- Pets with fur and feathers can be an asthma trigger for many people. Think carefully before adding a dog, cat or bird to your household. If you already have a pet like this you may need to make some changes. The child's bedroom at least should be a pet-free zone.
- Another common trigger for children is exercise. If your child has trouble with sports or other physical activity, talk to your doctor about the possibility of prescribing medicine for use before exercising.
- Keep an eye on the pollen and air quality forecast in your area, and limit the amount of time your child plays outdoors on bad air days. Go to airnow.gov to look up the forecast for your ZIP code each day.
- Remember that children can not always control their own environment, and may need you to advocate for them.[25]

Figure 2-16: Indiana Childhood Cancer Death Rates, 1985-2010



Source: ISDH Maternal and Child Health Division

Childhood Cancer

About 1 in 4,000 Hoosier children age 0-5 are diagnosed each year with some type of cancer. While relatively few children get cancer, cancer causes more childhood deaths than any other disease. The rate of childhood cancer in Indiana has remained stable from 1998 to 2007; however, the cancer death rate has fluctuated. During that time period, nearly 3,000 cancer cases for children age 0-19 were reported to Indiana's Cancer Registry.

Table 2-1: Indiana Childhood Cancer Rates, 2003-2007

	Age-Specific Cancer Rates per 100,000 Children	
	<1 Year Old	1-4 Years
All Tumors	27.53	22.33
Females	32	21.92
Males	23.28	22.72
Black	23.98	14.15
White	26	23.21

Source: Indiana State Department of Health

Children under age 5 and adolescents between 15 and 19 tended to have more cancers than children ages 5-14. Childhood cancer-related death rates fell between 1987 and 2007, as shown in Figure 2-16. Figure 2-16[26] shows cancer rates for all children, ages 0-19, not just young children age 0-5.

Table 2-1 shows the rates of cancer in Indiana from 2003-07 for children under 1 year old and children ages 1-4, based on 100,000 children. This table shows that white children have higher cancer rates than black children – 64 percent higher than black children in the 1-4 age category.

In 2003-2007, the most common cancer types in Indiana children under age 5 were the leukemias (blood cell cancers), central nervous system tumors, and the neuroblastoma and peripheral nervous system tumors. These are also the most common childhood cancers found nationwide, although the age groups for peak susceptibility show some differences.

The causes of childhood cancer remain largely unknown. According to the National Cancer Institute, many factors contribute to childhood cancer, including genetics, diet, lifestyle, hormones, viruses, and the environment.[27] Scientists are conducting a number of studies examining the possible links between childhood cancers and environmental toxins, such as pesticides, solvents, and household chemicals.[28]

We know that some illnesses and chronic diseases can be prevented by avoiding exposure to environmental threats. The following chapters will look at the environments in which Hoosier children live, learn and play, and environmental threats that might be found there. We can achieve a healthier future for Indiana by working to reduce threats that affect young children and women of child-bearing age.

What Families Need to Know

Since scientists don't know what causes childhood cancer, there's no guaranteed way to prevent the disease. However, there are things you can do to reduce children's cancer risks. Health experts recommend avoiding exposure to tobacco smoke, pesticides, solvents and household chemicals during pregnancy and early childhood. To avoid sun damage and skin cancer later in life, always use sunscreen when young children are playing outside.

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Sunny Start
Healthy Bodies Healthy Minds

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2012 REPORT

Chapter 3

The Air Children Breathe

Introduction

Whether they are indoors or outside, children can breathe in pollutants that can affect their airways and lungs, causing symptoms such as coughing, shortness of breath, and inflammation of the lungs.[1]

Breathing unhealthy air can also aggravate conditions such as asthma, bronchitis and lung disease.

Physically, children are more sensitive to air pollution than adults because their lungs are still developing, their airways are narrower, they breathe more rapidly, and – pound for pound – they inhale more air, and therefore pollutants, than adults.[2]

Because children spend a lot of time indoors where air filtration and ventilation may be poor, they are often exposed to pollution levels 2-5 times greater than outdoor environments.[3]

Outdoors, children are exposed to more air pollution because they are generally more active than adults. Common sense tells us that a child playing on a playground is breathing in much more air than an adult watching him from a park bench.

Indoor Air Quality

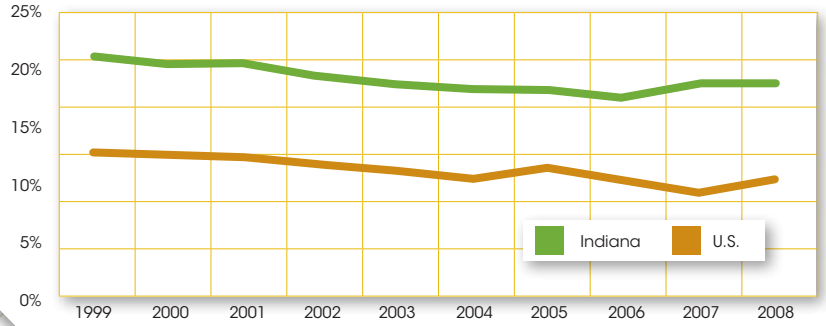
Children spend an estimated 80 to 90 percent of their time indoors at home, school, or child care settings. Therefore, healthy indoor air is vital for a healthy child.[4] Indoor air pollutants include tobacco smoke, gases from stoves, and gases and vapors from furnishings and construction materials. Home cleaning supplies, insect sprays, air fresheners and candles can also emit gases that affect a child's lungs.

Smoking During Pregnancy

When a mom smokes while she is pregnant, there's a higher risk her baby will have a low birthweight, be born too early, or fall victim to miscarriage or infant death. Smoking during pregnancy also can impact a child's health and development into adulthood.[5] Even moms exposed to secondhand smoke during pregnancy are putting their baby at risk. Studies show these babies have lower thinking skills at age 2, compared to children of mothers who lived in smoke-free homes during pregnancy.[6]

Since 1990, prenatal smoking in Indiana has been declining. However, when compared to the rest of the nation, Indiana is falling behind. From 1999 – 2008 smoking during pregnancy declined by 11 percent in Indiana compared to a 21 percent decline in the U.S. (Figure 3-1). Additionally, while Indiana's prenatal smoking rates are declining overall, the State Department of Health says some geographic areas show no significant improvement since 1990.[7]

Figure 3-1: Smoking during Pregnancy: Indiana vs. United States, 1999-2008



Source: ISDH. Note: Because of changes to birth certificates, 2007-08 tobacco data are not strictly comparable with data from prior years.

Pregnant Women and Smoking by County

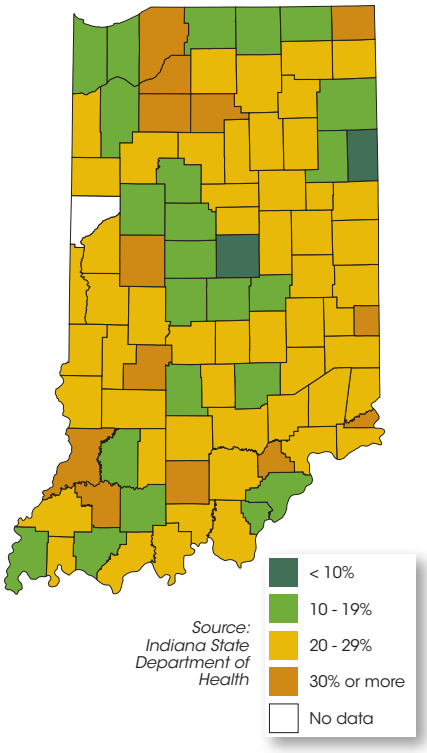
In Indiana, the counties with the highest rates of prenatal smoking are primarily in the rural areas (Figure 3-2). In 14 mostly rural counties, more than 30 percent of new mothers said they had used cigarettes while pregnant in 2008:

- Steuben (35.4 percent)
- Ohio (35.1)
- Starke (34.5)
- Crawford (34.4)
- Pike (33.8)
- Scott (33.6)
- Orange (33.5)
- Pulaski (33.5)
- Owen (32.0)
- Union (31.0)
- Fulton (30.9)
- LaPorte (30.9)
- Montgomery (30.7)
- Knox (30.4)

In comparison, fewer women smoke during pregnancy in urban counties. Marion (Indianapolis) was at 15.7 percent, Allen (Fort Wayne) reported 16.5 percent and Lake (part of the Chicago metropolitan area) was at 13.5 percent. The lowest prenatal smoking rate in Indiana was in Hamilton County (4.3 percent).

Additionally, while prenatal smoking rates are lowering across the rest of the state, the rates in rural counties remain unchanged. The Indiana State Department of Health (ISDH) has found that most counties with high smoking rates are rural, located in the southern half of the state, and have shown no significant improvement in their prenatal smoking rates since the early 1990s.[8]

Figure 3-2: Smoking during Pregnancy by County, 2008



Source: Indiana State Department of Health

Pregnant Women and Smoking: Race and Ethnicity

White mothers in Indiana are more likely to smoke during pregnancy than black mothers (Figure 3-3). Non-Hispanic women are also more likely to smoke during pregnancy than Hispanic women (Figure 3-4).

From 1990 to 2004, prenatal smoking in Indiana declined by 32 percent, compared to a 45 percent decline in the national rate. During that time period, the gap between the prenatal smoking rates in Indiana and the U.S. widened, with Indiana being 44 percent above the national rate in 1990 and 77 percent above the national rate by 2004.[9]

Figure 3-3: Smoking during Pregnancy by Race, 1998-2007

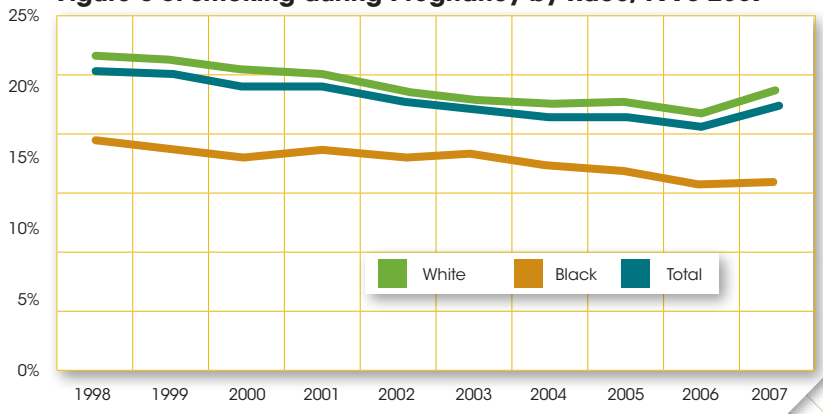
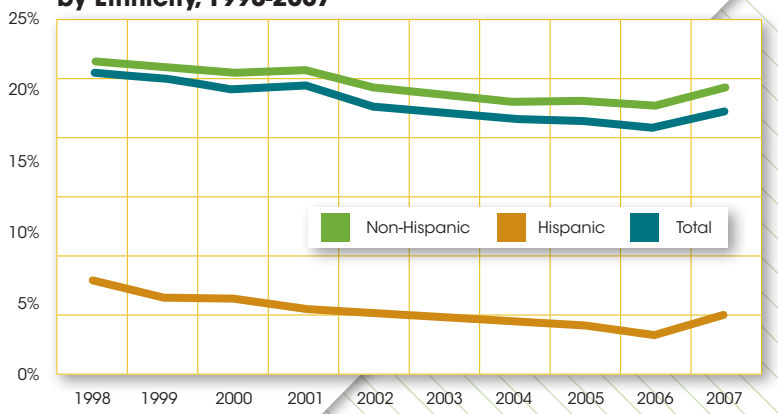


Figure 3-4: Smoking during Pregnancy by Ethnicity, 1998-2007



Source: Indiana State Department of Health, ERC, Data Analysis Team, 2011

Second-Hand Smoke

Second-hand smoke includes both exhaled smoke and smoke released directly from cigarettes, cigars and pipes. It contains more than 4,000 chemical compounds and is known to cause cancer in people.[10]

Tobacco smoke is one of the most common sources of indoor air pollution and one of the most important indicators of unhealthy air for children. Children exposed to secondhand smoke have higher rates of pneumonia, bronchitis, fluid behind the eardrum, and sudden infant death syndrome (SIDS). Secondhand smoke can cause children with asthma to experience more severe symptoms and more frequent attacks. Overall, breathing in secondhand smoke during childhood may increase the risk of developing cancer, both in childhood and adulthood.[11]

According to ISDH, at least 1,426 adults, children and infants in Indiana died in 2008 from diseases definitively tied to secondhand smoke by the US Surgeon General. Secondhand smoke cost Indiana $1.3 billion in healthcare costs and loss of life.[12]

The adult smoking rate in Indiana is at an historic low of 21.2 percent, but it remains one of the highest adult smoking rates in the nation.[13] While much progress has been made, 420,000 children in Indiana are still exposed to second-hand smoke at home.[14] According to the American Academy of Pediatrics, in 2009 an estimated 43 percent of U.S. children 2 months to 11 years of age lived in homes with at least one smoker.

Fortunately, an increasing number of homes in Indiana are smoke-free. Between 2002 and 2008, the proportion of households that converted from smoking to smoke-free doubled.[15]

Indiana's statewide smoke-free law goes into effect July 1, 2012. It bans smoking in most workplaces, but carves out exceptions for casinos, bars, private clubs, tobacco stores and cigar/hooka bars. Pregnant women working in these establishments will be exposed to secondhand smoke.

Under the new law:

- Children are allowed in nonprofit private clubs and fraternal organizations that vote to allow smoking. However, children must be in an enclosed area with a ventilation system. The organizations must vote every two years to continue to allow smoking.
- Smoking is banned at charity gaming events, such as bingo games at churches and schools.
- Smoking is allowed for at-home businesses, as long as only people who live in the home work at the business.

Smoke-Free Laws

Smoke-free laws make a difference in indoor air quality. Across three Indiana cities, studies showed fine particles in indoor air fell 94 percent in venues required to be smoke-free compared to those where smoking was permitted. Where smoking was not restricted by law, full-time bar and restaurant employees were exposed on the job to more than seven times the annual limit of fine particulate air pollution recommended by the EPA.

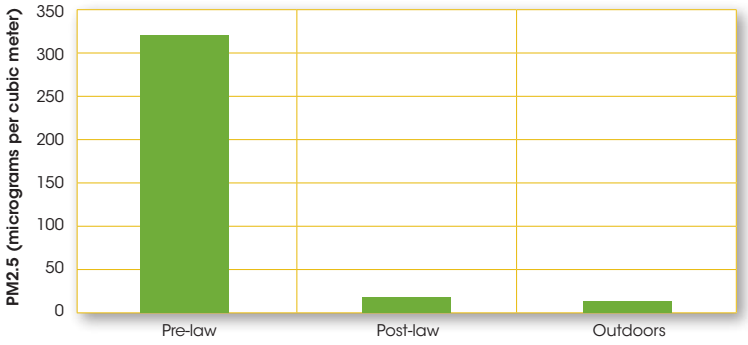
For example, a 2007 smoke-free ordinance in Fort Wayne showed significant improvement in indoor air quality in workplaces that are now smoke-free.

The average level of fine particle indoor air pollution declined 94 percent after the Fort Wayne ordinance went into effect. (Figure 3-5)

Before the law, a full-time employee's average annual exposure to small particle pollution was more than five times U.S. EPA's annual limit.

After the smoke-free air law, those same workers were exposed to safe levels of small particles.

Figure 3-5: Indoor Air Pollution Before and After Fort Wayne Smoke-Free Ordinance



Source: ISDH Tobacco Prevention and Cessation: http://www.in.gov/isdh/tpc/files/factsheet_AMstudies_7_6_2011.pdf

What Families Need to Know

According to the American Academy of Pediatrics, you can reduce indoor air pollution by following these steps:

- Do not allow smoking in your home.
- Keep children away from secondhand smoke.
- Have a working carbon monoxide detector on each sleeping level in your home.
- Keep your home dry and promptly fix water leaks to reduce or prevent mold.
- Keep the door between the house and an attached garage tightly closed.
- Have wood stoves and fireplaces checked every year by a professional.
- Do not use gas ovens to heat your home.
- Keep children away from mothballs.
- Avoid using air fresheners.[16]

Outdoor Air Quality

The quality of the outdoor air children breathe can have an immediate impact on their airways. Many of the pollutants found in outdoor air cause symptoms such as coughing, shortness of breath, and asthma attacks. Some recent studies show long-term effects of exposure to outdoor air pollution, such as reduced lung growth and chronic lung disease in adults who lived in more polluted areas as a child.[17]

Outdoor air pollutants come from sources such as cars and trucks, emissions from power plants and other industrial operations. For some pollutants, such as lead or sulfur dioxide, being closer to the source increases the risk of exposure. Other pollutants, such as ozone, can impact a much wider area. Additionally, the risk of exposure can be influenced by factors such as weather, with greater risks during certain seasons or even at a particular time of day.

Figure 3-6: Indiana's Air Monitoring Network

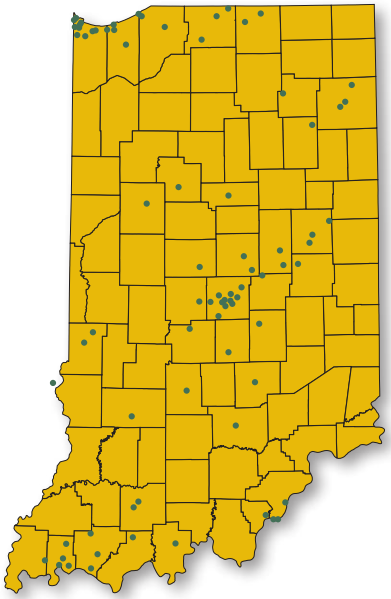
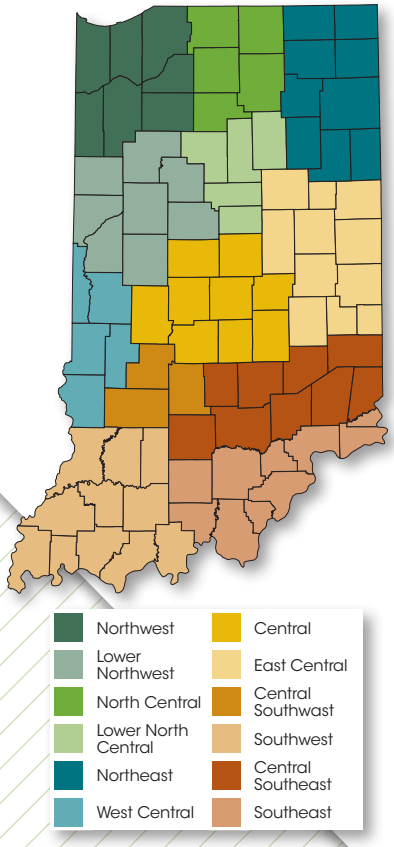


Figure 3-7: Indiana Regional Air Map



Source: Indiana Department of Environmental Management

Indiana's overall air quality has improved and most of the state now meets federal standards for outdoor air quality. Recent research, however, has suggested there may be health effects from outdoor air at pollution levels previously considered "safe."[18] We know there are still some days when Indiana's air is less safe, particularly for sensitive groups such as children, the elderly and those with asthma or other breathing difficulties.

Indiana operates a network of air monitors placed around the state to monitor for different pollutants. Figure 3-6 shows where these monitors are located. Many parts of the state have no monitors. In these areas, the state uses computer programs to estimate pollution levels. For this report, we've used monitoring data in the regions shown in Figure 3-7 to review air quality conditions around Indiana.[19]

U.S. EPA's Air Quality Index is used to indicate how clean or polluted the air is. The index uses the colors shown in Table 3-1 to indicate health concerns when authorities issue air pollution forecasts or warnings. Some sensitive groups face greater risk from air pollution. These groups include children, the elderly and people with respiratory disease, such as asthma. You can visit airnow.gov to see an air quality forecast for today and tomorrow in your area, or anywhere in the United States. You also can view real-time air pollution levels at Indiana monitors at in.gov/idem/airfacts/.

Sulfur Dioxide

Sulfur dioxide causes the most frequent problems with meeting current health-based air quality standards in Indiana. Sulfur dioxide, or SO_2, is formed when fuel that contains sulfur (mainly coal and oil) is burned. SO_2 also forms during metal smelting, oil refining, and other industrial processes.

High concentrations of SO_2 can affect breathing, cause lung disease, and aggravate existing cardiovascular diseases. Children, the elderly, and people with asthma, cardiovascular disease, or chronic lung disease (such as bronchitis or emphysema) are most susceptible.[20]

SO_2 also causes acid rain, which leads to acidification of soils, lakes, and streams and can accelerate damage to trees, crops, buildings, and monuments. In addition, sulfur contributes to fine particles in the air, which is a significant health concern.

The highest concentrations of SO_2 are found near large industrial facilities. Coal-fired power plants account for most SO_2 emissions in Indiana. Many Indiana power plants have reduced SO_2 emissions by using low-sulfur coal and investing in air pollution control equipment, such as scrubbers. However, some older plants have not been improved.

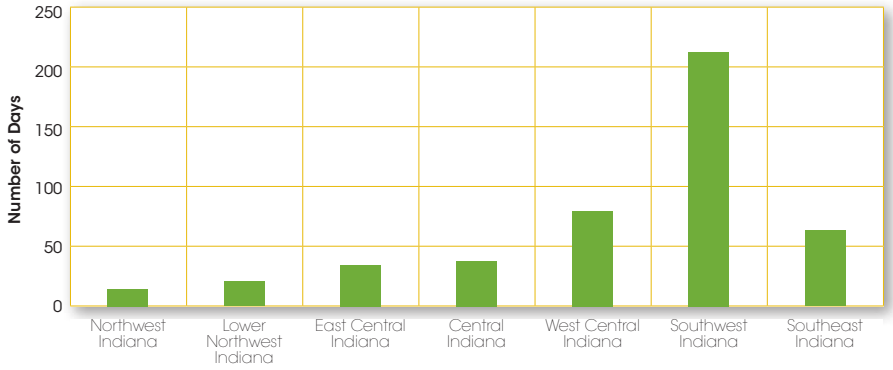
IDEM's monitoring shows that annual measures of the 1-hour sulfur dioxide levels have generally fallen from 2000-2010. However, a number of counties frequently have sulfur dioxide levels considered unhealthy under a new federal standard.

Table 3-1: National Air Quality Index		
"Air Quality Index Levels of Health Concern"	**Numerical Value**	**Meaning**
Good	0-50	Air quality is considered satisfactory, and air pollution poses little or no risk.
Moderate	51-100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups, including Children	101-150	Members of sensitive groups, such as children and people with asthma, may experience health effects. The general public is not likely to be affected.
Unhealthy	151-200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201-300	Health alert; everyone may experience more serious health effects.
Hazardous	> 300	Health warnings of emergency conditions. The entire population is more likely to be affected.

Source: U.S. Environmental Protection Agency

Figure 3-8 shows the number of days in different Indiana regions where SO_2 reached levels considered unhealthy for children and adults with asthma from 2008-10. Southwest Indiana had more than 200 days when SO_2 reached levels considered unhealthy for sensitive groups, and West Central and Southeast Indiana each had more than 50. These regions also have the highest number of coal-fired power plants in the state.

Figure 3-8: Days with Sulfur Dioxide Values Considered Unhealthy For Children with Asthma by Region, 2008-2010



Source: Indiana Department of Environmental Management

Note: The following regions do not have monitors: North Central, Lower North Central, Northeast, Central Southwest, Central Southeast

In 2011, U.S. EPA announced a new health-based 1-hour standard for SO_2 in the air. The revised standard improves public health protection, especially for children, the elderly, and people with asthma, by reducing their exposure to high short-term SO_2 concentrations. The Indiana Department of Environmental Management (IDEM) predicts that portions of seven Indiana counties will not meet this new standard, as shown in Figure 3-9.[21] Those areas are:

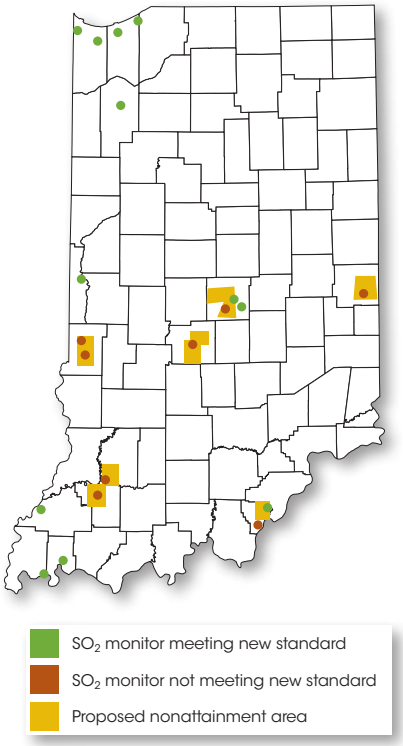
Wayne Township in Wayne County
Harrison Township in Vigo County
Center, Perry and Wayne Townships in Marion County
Clay and Washington Townships in Morgan County
Veale Township in Daviess County
Washington Township in Pike County
New Albany Township in Floyd County

Areas not meeting the new standard may face stricter air permit requirements and other measures to reduce air pollution. Because SO_2 levels are falling overall due to federal regulations, IDEM says some of these areas may meet the new standard before final decisions are made on nonattainment status.

What Families Need to Know

Monitor your local air quality forecast at airnow.gov.
Also, you can reduce air pollution from power plants by:
- Reducing your electricity usage. Visit energizingindiana.com for free help.
- Supporting cleaner forms of energy in Indiana, such as wind and solar.

Figure 3-9 Indiana Areas Not Meeting New Federal SO2 Standard



Source: Indiana Department of Environmental Management

Particle Pollution

Particulate matter includes small pieces of aerosol mists, dust, dirt, and soot found in the air. Some particles are large or dark enough to be seen as soot or smoke. Others are so small they can be detected only with a microscope.

Studies show the smallest particles pose the most serious particle-related health threat because they can be inhaled more deeply into the lungs and are more difficult to exhale. The smallest particles are known as $PM_{2.5}$. Elevated levels of $PM_{2.5}$ are associated with increased hospital admissions and emergency room visits for heart and lung disease. In children, these tiny particles can aggravate asthma and allergies, reduce lung development and lead to more hospital and doctor visits.[22]

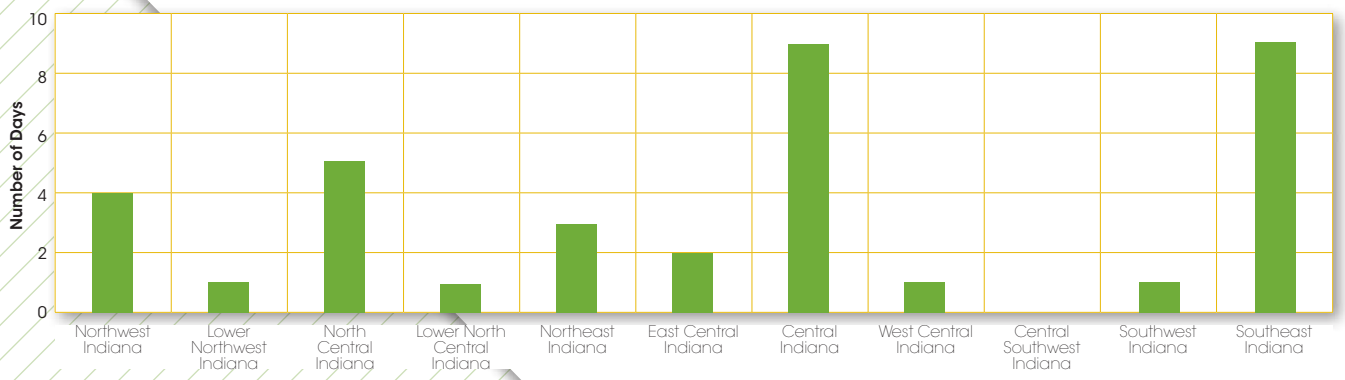
Particle pollution comes from cars, trucks, power plants, fires and wood stoves. Some larger or "coarse" particles are made up of dust that is formed when rock or soil breaks down.

In addition to health problems, elevated levels of $PM_{2.5}$ are the major cause of hazy skies in many parts of the United States. Haze impairs visibility in many scenic overlooks, national parks, and even from tall buildings in urban areas.

Indiana's $PM_{2.5}$ air quality meets federal standards established to protect the health of all citizens, including those in sensitive groups. However, there are times when short-term peaks pose some risk to people with asthma and other heart and lung diseases.

Figure 3-10 shows the number of days from 2008-10 that different regions of Indiana had fine particle levels classified as "unhealthy for sensitive groups." On these days, U.S. EPA advises children and people with respiratory disease, such as asthma, to reduce outdoor activities that cause harder-than-normal breathing. This includes any day in which the highest $PM_{2.5}$ values were above the federal standard. Central Indiana and Southeast Indiana experienced the most days when particulates reached levels considered unhealthy for sensitive groups.

Figure 3-10: Days with PM2.5 Values Classified as Unhealthy For Children by Region, 2008-2010



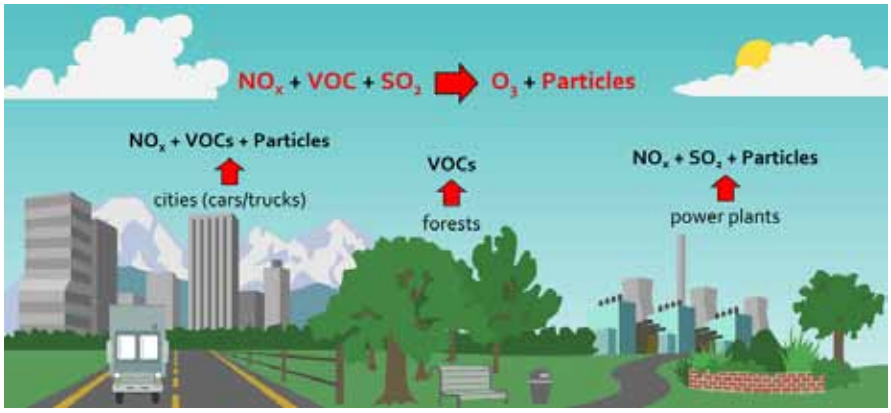
Ozone

Ozone (or O_3) is a gas that forms in the atmosphere by a chemical reaction between nitrogen oxides (NO_x) and volatile organic compounds (VOC) in the presence of sunlight. Ozone can be good or bad depending on its location in the atmosphere. Ozone in the upper atmosphere provides protection from the sun's radiation. Ozone at ground-level can trigger a variety of health problems. Ozone is an air quality problem in the summer months when temperatures are high, daylight hours are long, and there is little to no wind.

VOCs come from cars and trucks, gasoline, some solvents and cleaners, and paints. NO_x emissions mostly come from the burning of fossil fuels in cars, trucks, power plants, and industrial boilers. Emissions of NO_x from tall sources, such as smokestacks, are more likely than emissions near the ground (e.g. motor vehicles) to travel downwind and increase ozone levels in surrounding areas and even other states.

High levels of ozone can damage lung tissue, reduce lung function, and make the lungs more sensitive to other irritants. When inhaled, ozone can cause acute respiratory problems such as shortness of breath, chest pain, wheezing, coughing, and can aggravate asthma. In addition, breathing air with elevated ozone can impair the body's immune system, making people more susceptible to respiratory illness, including bronchitis and pneumonia. Repeatedly breathing air with elevated ozone for several months may cause permanent structural damage to the lungs.[23]

Figure 3-11: How Ozone Forms in the Air



Indiana's ozone air quality meets federal standards established to protect the health of all citizens, including those in sensitive groups. However, there are times when short-term peaks pose some risk to people with asthma and other lung diseases. Figure 3-12 (on the next page) shows the number of days from 2008-2010 when peak ozone reached levels considered unhealthy for children and other sensitive groups. During these times, sensitive children and people with respiratory disease, such as asthma, are advised to limit outdoor activities that cause harder-than-normal breathing. Central, Southwest and Southeast Indiana had the most days when ozone reached levels considered unhealthy for sensitive groups.

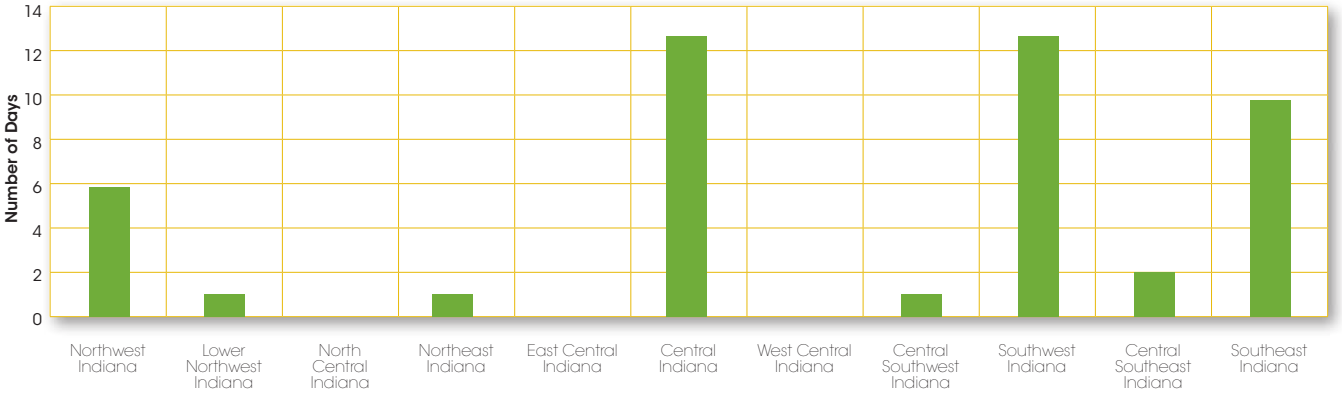
What Families Need to Know

Reduce driving and save electricity to reduce air pollution.

Never burn trash and reduce the use of wood-burning stoves and fireplaces.

Monitor your local air quality forecast at airnow.gov.

Figure 3-12: Days with Ozone Values Considered Unhealthy for Children by Region, 2008-2010



Source: Indiana Department of Environmental Management
Note: The following region does not have an ozone monitor: Lower North Central

What Families Need to Know

Check the ozone levels in your area at airnow.gov. U.S. EPA recommends that children should limit outdoor activities that cause harder-than-normal breathing when the ozone Air Quality Index levels exceed 100.[26]

Help reduce ozone pollution by taking action on Ozone Action Days: Drive your car less or not at all. Never leave your engine running when the car is not moving. Avoid mowing your lawn or filling up your gas tank until after 6 p.m.

While high ozone levels are relatively rare, because ozone forms in hot, sunny weather, anyone who spends a lot of time outdoors during the summer is at some additional risk, particularly children, moderate exercisers, and outdoor workers. Children are at greater risk because their respiratory systems are still developing and are more susceptible to environmental threats. Sensitive people, such as those with existing lung disease, asthma, chronic bronchitis, and emphysema, are at particular risk from high ozone levels.

High levels of ozone also interfere with the ability of plants to produce and store food. Ozone has been shown to reduce agricultural yields for many important crops such as soybeans, kidney beans, corn, wheat, and cotton.[24]

While harmful ozone concentrations are typically formed in more urban areas, wind can carry ozone pollutants hundreds of miles away from their original sources, putting rural areas at risk.[25]

Lead

Lead is a toxic metal that is emitted into the air as small particles. As noted earlier in Chapter 2, excessive exposure to lead can cause mental and physical damage, especially to children. Exposure occurs mainly through inhaling lead in the air or ingesting lead in food, water, soil, dust, or paint chips. Even at low doses, lead exposure is associated with damage to the nervous systems of fetuses and young children, resulting in learning problems and lower IQ.

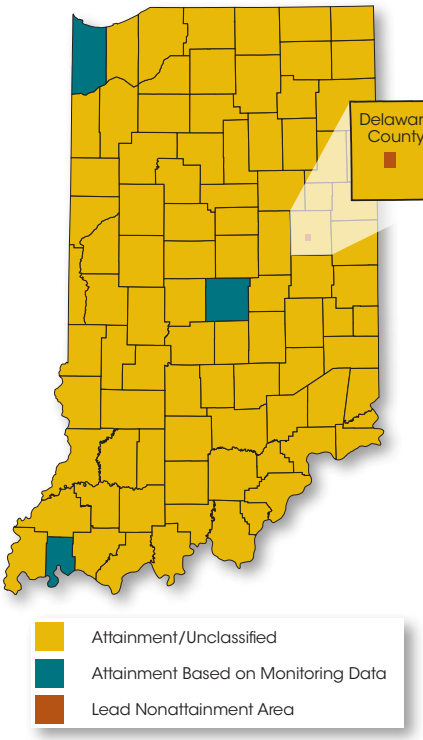
When gasoline had lead in it, cars and trucks were the major source of lead in the atmosphere. Between 1975 and 1986, the U.S. EPA required phasing lead out of gasoline. Since then, the amount of lead released to the air from cars and trucks has declined dramatically. However, lead remains in the soil near roadways, especially in older neighborhoods.

Today, metal processing, which uses lead to manufacture finished products, is one of the major sources of lead emissions in Indiana. The highest concentrations of lead in the air are found around lead smelters. In Indiana, lead smelters recycle material that contains lead and other substances, such as batteries, and processes the raw materials into usable products.[27]

In 2010, U.S. EPA made the lead standard 10 times more stringent by changing it from 1.5 micrograms per cubic meter to 0.15 micrograms per cubic meter. The only area not meeting the new lead standard for outdoor air in Indiana is an area on Muncie's south side, in Delaware County (Figure 3-13). This area is near a facility that is a large maker and recycler of lead acid batteries. The facility is working to reduce its emissions to bring that neighborhood into compliance with the Clean Air Act.

Lead also remains a concern in soil and dust in and around older housing and along roadways. These issues will be discussed further in the Healthy Housing chapter.

Figure 3-13: Portion of Muncie Not Meeting Lead Standards



Source: Indiana Department of Environmental Management, accessed at http://www.in.gov/idem/files/nonattain_lead_final_rec.pdf

What Families Need to Know

Don't let children play in bare dirt, especially in urban areas and along roadways.

Learn other ways to protect children from lead poisoning at leadfreekids.org.

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Sunny Start
Healthy Bodies Healthy Minds

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2012 REPORT

Chapter 4

The Water Children Drink, Bathe & Play In

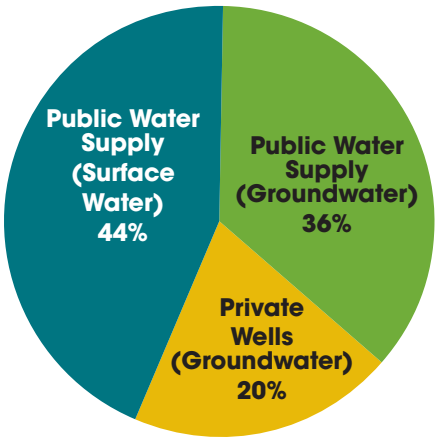
Introduction

Water is an essential part of a child's health, but it can also present risks for exposure to waterborne illnesses and other pollutants. Because children's bodies and immune systems are still developing, they are more susceptible to waterborne chemicals that affect learning, motor skills and hormones during important stages of growth. Additionally, children drink more water per pound of body weight than adults do, are more likely to swallow bath water, and more frequently swim and play in public pools and waterways.[1]

While federal regulations are designed to ensure safe drinking water and sewage treatment, problems can sometimes occur during severe weather, such as flooding, and during the treatment process, allowing contaminants to enter waterways and the drinking water supply. Swallowing water with bacteria and viruses can cause sudden health effects, such as vomiting and diarrhea.

Children and pregnant women who eat fish from contaminated water can be exposed to toxins such as mercury and PCBs. Public beaches, waterways and pools are also sources of waterborne illnesses and exposure to contaminants. Children face greater risks because they are more likely than adults to swim and play in these areas.[2]

Figure 4-1: Where Hoosiers Get their Drinking Water, 2010



Source: Indiana Department of Environmental Management

Drinking Water

Public Water Systems

About 5 million Hoosiers (more than 80 percent) get their drinking water from a public water system. These systems are usually operated by a city, town or private water company. Water companies can draw water from either water underground (groundwater) or from surface water in Indiana's lakes, rivers or streams. Figure 4-1 shows the percent of Indiana's population served by different types of drinking water systems. Public water must be monitored, tested, and treated to meet drinking water standards.[3]

According to the Indiana Department of Environmental Management (IDEM), 99 percent of the population served by a community public water system in Indiana drank water that met health standards in 2010. However, about 28 percent of systems – mostly small providers – had violations for not meeting sampling and reporting requirements. Eight percent of systems violated health-based standards.[4] These systems only serve a small percentage of the population, but ensuring consumers have safe supplies of water is important so each of them was required to correct the problem or supply bottled water to their customers.

More than half of Indiana's 4,200 public water systems serve less than 100 people. Some of these systems serve small towns, while others are "noncommunity" systems – such as schools, businesses, campgrounds or gas stations that have their own water supply, usually a well. According to IDEM, small systems often face challenges such as lack of funding and management capacity. Drinking water systems require regular maintenance and improvements to prevent problems, as well as knowledge of treatment options to remove contaminants. Problems in communities can include failure to raise funding to meet the cost of service, lack of maintenance schedule, no plan to replace aging equipment, and lack of attention to the water utility.

Because federal rules continue to place additional requirements on these small systems, many need help with the technical, managerial and financial details of ensuring safe drinking water. IDEM helps these small drinking water suppliers by analyzing their capabilities and shortcomings, sending staff to assist them, reminding them of sampling and reporting deadlines, and paying for testing and reporting for small systems that qualify. With more than 4,000 of these small systems, it is difficult for IDEM staff to provide on-site assistance to each one.

Private Wells

About 1 million Hoosiers get their drinking water from private wells. Most rural families rely on untreated groundwater from private wells for their drinking water. Private wells are also still found in cities, isolated suburbs and other communities that haven't fully extended drinking water service to their residents.

Private wells do not have to be monitored and treated, as required for public wells used for drinking water. Any contamination in the groundwater can migrate into a private drinking water well.

According to the U.S. Geological Survey (USGS) and IDEM, groundwater contamination can come from septic systems, fertilizers and pesticides, landfills, salt-storage piles, natural contaminants, underground storage tanks, chemical spills and concentrated animal feedlots. For families with young children in Indiana, the main concerns are pathogens, nitrates, pesticides and natural contaminants such as arsenic.

Pathogens: Pathogens are disease-causing organisms such as bacteria, viruses and parasites that can be found in inadequately treated drinking water. Pathogens can be a very serious concern to families on private wells. Pathogens can come from failed septic systems or from surface water runoff that carries waste from livestock, pets or wildlife.

Pathogens are more likely to contaminate a well if the well is shallow, the well casing is cracked or the well is located too close to a feedlot, septic system, farm field where manure is spread or other pollution sources. Under normal conditions, soil naturally filters pathogens from rainwater and snowmelt before it reaches the groundwater supplying a private well. During heavy rains or flooding, soils cannot keep up and wells can become contaminated rapidly.

Private wells need to be monitored, maintained and located away from potential contamination. If testing finds pathogens, the well must be disinfected immediately. Contact a certified well driller or your local health department for help with disinfection.[6]

What Families Need to Know About Fluoride in Drinking Water

Fluoride has been proven to prevent cavities when taken in small amounts on a regular basis. In the 1960s, the federal government recommended that fluoride be added to drinking water, with the final decision made by each community. In 2008, 95 percent of people served by community water systems in Indiana were getting fluoridated water either naturally or through fluoride additions.

These statistics don't include families on private well water, but some Indiana well water contains natural fluoride. If your drinking water comes from a private well, consider having the well tested to determine how much fluoride is naturally present in the water. Then, ask your dentist if you need fluoride supplements.

Today, fluoride is available in toothpaste, mouth rinses and other dental products. Because of this, the federal government is lowering its recommended dose of fluoride in drinking water.

While fluoride has proven to be safe and effective, children under 6 have a poor swallowing reflex and tend to swallow much of the toothpaste on their brush. Too much fluoride in children under age 8 can discolor and cause pits in their teeth. To help prevent both tooth decay and excessive fluoride in young children, the Centers for Disease Control and Prevention (CDC) recommends:

- You can use fluoridated water for preparing infant formula. However, if formula with fluoridated water is the only thing your baby drinks, he may be getting too much fluoride that might affect his developing teeth.
- As soon as the first tooth appears, begin cleaning by brushing without toothpaste with a small, soft-bristled toothbrush and plain water after each feeding.
- Begin using toothpaste with fluoride when the child is 2 years old. Use toothpaste with fluoride earlier if your child's doctor or dentist recommends it.
- Do not brush your child's teeth more than 2 times a day with fluoride toothpaste.
- Apply no more than a pea-sized amount of toothpaste to the toothbrush.
- Supervise your child's tooth brushing, encouraging the child to spit out toothpaste rather than swallow it.[5]

Additional information is available on-line: www.cdc.gov/oralhealth/publications/factsheets/brushup.htm.

Figure 4-2: Indiana Groundwater Vulnerable to Nitrates

Source: Purdue University, Agricultural Engineering. Accessed at https://engineering.purdue.edu/SafeWater/drinkinfo/nitrate.html, page 110 of pdf file.

Nitrates: Nitrates are a serious concern to families with young children. Nitrates rob the blood of its ability to carry oxygen. Too many nitrates in drinking water can cause blue baby syndrome, a potentially fatal illness. A tell-tale sign of blue baby syndrome is blue-tinted skin, especially in the fingers, toes and lips. Other symptoms include fatigue, low tolerance for exercise, difficulty breathing or eating, and heart murmurs. The child may also fail to gain weight and appear lethargic for no apparent reason.

Nitrates also have been linked to miscarriages. In 1996, the U.S. Centers for Disease Control and Prevention linked high nitrates in well water to six miscarriages in three women in LaGrange County, Ind. The three women became sick from well water polluted by a hog farm, according to the CDC. A fourth woman also miscarried twice, and her well was found to be contaminated with nitrates from a septic system.[7] Not all studies agree, however. A more recent review suggested that there is not enough evidence to prove a link between nitrates in drinking water and problem pregnancies.[8]

Data collected by IDEM and USGS indicate that about 4 percent of Indiana wells exceed the nitrate standard. Most wells tested safe.

Where do nitrates come from? Groundwater can be contaminated with nitrates from fertilizers, crop residues and animal manure.

Some areas of the state are more vulnerable than others to nitrate pollution. Risks are higher for wells in sandy or gravelly soils, shallow groundwater, shallow or poorly sealed wells, and wells near septic systems, fertilizer and livestock wastes. IDEM monitors nitrates through Indiana's Groundwater Monitoring Network, which includes more than 150 public drinking water wells and 200 residential wells. Nitrate levels that don't meet safe drinking water standards have been found in some parts of the state. Drinking water compliance information for 2011 indicated that 21 public water systems (0.5 percent of all systems) detected nitrate above the federal maximum contaminant level. About 4 percent of wells tested in the ground water monitoring network in 2010 exceeded the drinking water standard.

The map in Figure 4-2 was prepared by Purdue University to identify parts of Indiana vulnerable to nitrate contamination due to these risk factors. Communities and well owners in high-risk areas should take extra precautions to protect wells from contamination. At a minimum, all well water should be tested at least once per year.[10]

Arsenic: Arsenic occurs naturally in rocks, soil, water, air, plants and animals. It can also be released into the environment through erosion of rocks and forest fires, or through human actions, such as burning coal containing arsenic. Higher levels of arsenic are more likely to be found in groundwater than surface water. Arsenic can leach out of rock formations and into drinking water wells. IDEM estimates that approximately 10 percent of private wells may have arsenic levels higher than U.S. EPA's maximum contaminant level for safe drinking water.

Exposure to arsenic can cause both short and long-term health effects. Long-term exposure to arsenic has been linked to cancer of the bladder, lungs, skin, kidneys, nasal passages, liver and prostate. Exposure to high levels of arsenic is unlikely from Indiana drinking water, but long-term exposure to lower levels of arsenic can occur. Results of IDEM's groundwater sampling for arsenic can be found on the agency's website (www.in.gov/idem/6762.htm).[11] Owners of private wells should have their well water tested for arsenic. Public water supplies are required to routinely test for arsenic and keep arsenic at safe levels.

Pesticides: A pesticide is any substance designed to prevent, kill, repel or control a pest. Pests include insects, mice, rats, weeds, birds, animals or disease that might harm property, cause disease or cause a nuisance. Some examples include weed killers, mice or rat poisons, and insect sprays, powders or baits. Pesticides can serve a useful purpose if used according to directions and only when other control methods have failed. However, it's important to remember that using pesticides as a first solution can be risky, especially for young children.

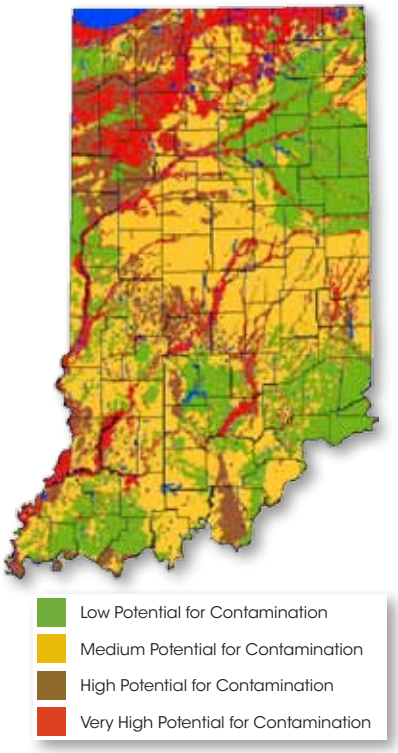
The toxic effects used by some pesticides to kill pests can also harm or kill human beings, if used improperly. Because pesticides are found in food, homes, schools, yards and parks, children are frequently exposed. Children face increased risks if their parents are farmers or farm workers, pesticide applicators, or landscapers or if they live next to agricultural areas. Children and teenagers may work or play in farm fields, where they may be exposed to pesticides.[12] Dogs and cats can also bring pesticides into the home, and pesticide residues can remain on food purchased at the grocery store.

Nearly 70 percent of Indiana's land is devoted to agricultural usage, and nearly 60 percent of Hoosiers rely on groundwater as a water source. From 1984-1992, state and federal agencies collaborated to look for pesticides in groundwater in 82 of Indiana's 92 counties. The agencies took samples from wells used for community drinking water as well as by individual homeowners. At least one pesticide was detected in 11 percent of wells and springs. The most common pesticides found were weed killers, such as alachlor, atrazine, and 2,4-D. Several pesticides were found at levels that exceeded the U.S. Environmental Protection Agency's standards for safe drinking water.[13]

More recently, IDEM monitored 223 Indiana wells for pesticides in 2010. Pesticides were detected in two wells, and in both cases the pesticide was below the federal maximum contaminant level. In 2011, public water systems reported seven pesticide detections (0.6 percent of systems sampling for pesticides) in ground water systems. One of these samples was above the maximum federal level.

As with nitrates, some groundwater is more vulnerable to pesticides. Purdue University has mapped areas in Indiana that are vulnerable to groundwater contamination from pesticides. Groundwater can be more vulnerable to pesticides if the water table is high, soils are porous or ground surface is flat. The map (Figure 4-3) shows that approximately 30 percent of Indiana's groundwater is highly or very highly vulnerable to pesticide contamination. Approximately 80 percent of groundwater pesticide detections in Indiana have been found in these highly or very highly vulnerable areas. The state's Pesticide Management Plan recommended best management practices, restrictions or, in some cases, bans on pesticide use where necessary to protect vulnerable groundwater.[14]

Figure 4-3: Indiana Groundwater Vulnerable to Pesticide Contamination



Source: Purdue University, Agricultural Engineering. Accessed at http://www.isco.purdue.edu/pesticide/pmp/pmp_summary.pdf, page 111 of pdf file.

What Families Need to Know

If you pay a water bill you are served by a public water system. Your water company must notify you when contaminants are in the water that may cause illness or other problems. You should also receive an annual consumer confidence report.

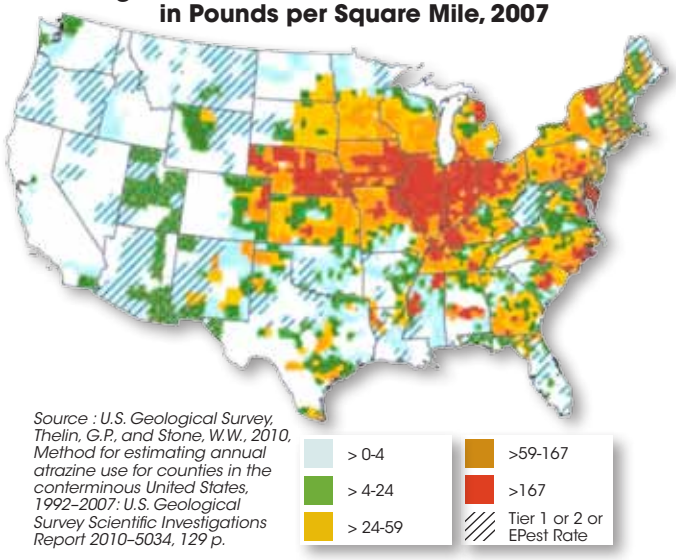
If you get drinking water from a private well, you are responsible for the safety of your drinking water. Contamination can cause blue baby syndrome, hepatitis, dysentery, cancer, or food poisoning.

- If you have a young child, it's important to get your well water tested. If your baby drinks formula, test your well for nitrates before you bring the baby home. Or, use bottled water instead of well water to mix the formula.
- Test your well water for bacteria each year.
- Inspect the condition of your well, making sure there are no cracks in the casing.
- Properly maintain your septic system by having it inspected and pumped every three to five years.
- Be aware of your well's proximity to potential contaminants, such as livestock, crops treated with pesticides, fertilizer used on lawns, and septic systems. Consider testing your well for pesticides if your well is near farm fields or other areas where pesticides are used.
- Have your drinking water tested for lead. Lead can come from older piping and plumbing in your home, or from city water lines in some instances. To reduce lead exposure from pipes in an older home, run your water for 30 seconds before using it for drinking or cooking.
- Contact your local health department or the State Department of Health (317-921-5874) to ask for a water testing kit.

Atrazine in Indiana Water

Atrazine is the most commonly applied herbicide in the United States, according to the U.S. Geological Survey. Approximately 21–27 percent of Indiana's land is planted each year with corn, and more than 85 percent of this area is treated with atrazine to kill weeds.[15] Most atrazine applications in Indiana occur during April and May which coincides with heavy spring rains. When it rains, atrazine moves out of farm fields and into nearby streams and reservoirs.[16] Figure 4-4 shows annual atrazine application by county in the United States in 2007, with the highest amounts applied in the "Corn Belt" states of Indiana, Illinois, Ohio, and Iowa.[17]

Figure 4-4: Estimated Atrazine Use on Corn in Pounds per Square Mile, 2007



Source : U.S. Geological Survey, Thelin, G.P., and Stone, W.W., 2010, Method for estimating annual atrazine use for counties in the conterminous United States, 1992–2007: U.S. Geological Survey Scientific Investigations Report 2010–5034, 129 p.

Concerns have been raised about atrazine because it is the most heavily used pesticide in Indiana, is the pesticide most frequently detected in waterways, and some researchers are concerned that it may cause health problems in infants. Purdue researchers studying 19 water systems in Indiana from 1993 to 2007 found that atrazine in drinking water during the third trimester was linked to a 17-19 percent increase in the number of low birthweight babies.[18] Other researchers have found that birth defects are more common in children conceived during the months of April, May, June or July – when pesticide levels in surface water and drinking water are higher. This study did not prove a cause-and-effect relationship, but did raise questions about atrazine and its effects on children's health.[19]

Like other farm, garden and lawn chemicals, atrazine finds its way to Indiana's rivers, lakes and reservoirs. According to USGS, atrazine is found at elevated concentrations in both streams and groundwater in agricultural areas in Indiana and throughout the Midwest. The greatest concern is atrazine in drinking water, because pregnant women and infants are most likely to be exposed through drinking water than surface water.

In the 1990s, the federal government became concerned about atrazine found in some Indiana drinking water systems. U.S. EPA set up a special monitoring program in communities with an atrazine history and found the pesticide in 47 percent of finished water samples. Between 1992-2003, eight public water supplies in Indiana were identified with atrazine concentrations that violated federal drinking water standards. These suppliers were required to install new treatment techniques to reduce atrazine levels.[20] The last time an Indiana public water system exceeded the atrazine maximum contaminant level was in 2005.

Smaller drinking water systems that use surface water are required to test only quarterly for atrazine, which may not be an ideal schedule since atrazine levels peak during the April-July months and are typically not seen the rest of the year. In 2010, IDEM worked with five small to medium water systems to test more frequently and treat incoming water when atrazine was detected. With IDEM's on-site assistance and free test kits, all five systems avoided any detected atrazine in their finished water.[21]

The Indiana State Chemist has recommended that Indiana farmers make adjustments to reduce atrazine runoff into waterways. For example, they say farmers should establish grass buffer strips along waterways; never mix, load or apply atrazine near a river or lake; and avoid applying atrazine when rain is on its way. Farmers that follow these recommendations can help make Indiana's drinking water safer.

Surface Water: Lakes, Reservoirs, Rivers and Streams

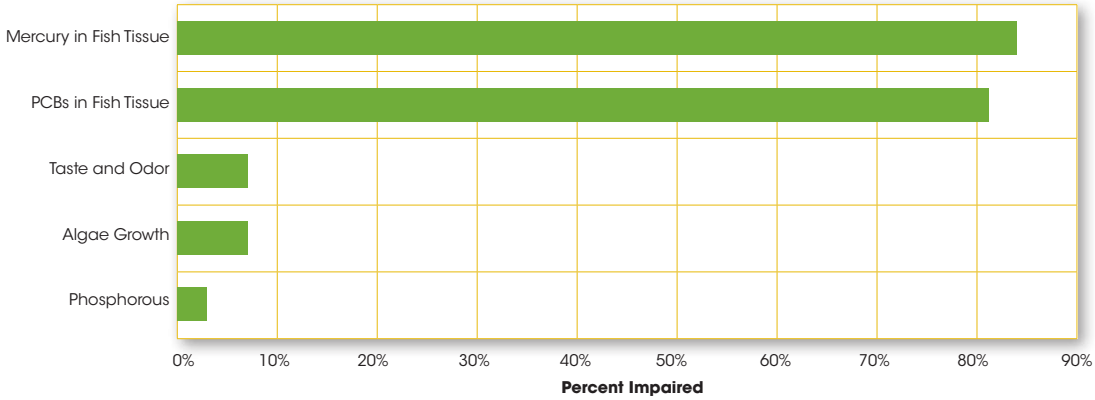
Indiana has a plentiful water supply which includes 35,673 miles of rivers and streams, more than 276,000 acres of lakes, reservoirs and ponds and 59 miles of Great Lakes shoreline.[22] These waterways can have an impact on children's health. Water from lakes, rivers and reservoirs is treated and then used for drinking water by about 40 percent of Indiana's population, including people living in Indianapolis and its suburbs, Fort Wayne, Evansville, Muncie, Hammond, East Chicago, Michigan City, Bloomington, Kokomo and several other cities.[23] Young children may also swim or play in Indiana's lakes, reservoirs or small neighborhood streams.

The Indiana Department of Environmental Management is responsible for monitoring the health of Indiana's waterways. Its scientists look for both water chemistry, such as bacteria and chemicals in the water, and the health of fish and other living things that make their home in the water. Indiana's goal is that all waterways should support swimming, safe drinking water, and provide healthy water for fish, wildlife and other water creatures.

Lakes, Reservoirs and Ponds

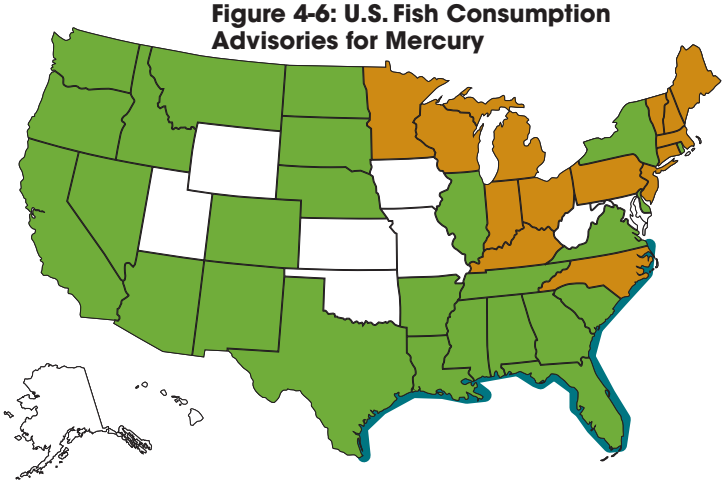
Young children can be exposed to water from lakes, reservoirs and ponds on a day at the beach, while learning how to fish, or when eating fish caught in Indiana waters. Indiana has approximately 1,500 lakes, reservoirs and ponds (approximately 122,303 acres), not including Lake Michigan. IDEM has monitored 198 of these (almost 73,076 acres) and has found 140 of them (72.2 percent) to be impaired. The most common problems are shown in Figure 4-5 (on the next page): mercury and PCBs found in fish that swim in these lakes. Generally, children under 15 and women planning to have children are cautioned not to eat more than one meal of fish per week to avoid mercury exposure. In some waterways and with some type of fish, children and women are cautioned to eat no more than one meal per month or to avoid fish altogether. To find out about the safety of fish in a waterway near you, go to fish4health.net.

Figure 4-5: Top Five Causes of Impairment in Indiana Lakes, Reservoirs and Ponds, 2010



Source: U.S. EPA, Indiana Assessment Data for 2010, accessed at http://iaspub.epa.gov/waters10/attains_state.report_control?p_state=IN&p_cycle=2010&p_report_type=A

Figure 4-6: U.S. Fish Consumption Advisories for Mercury



Source: http://www.epa.gov/ost/fish

Mercury

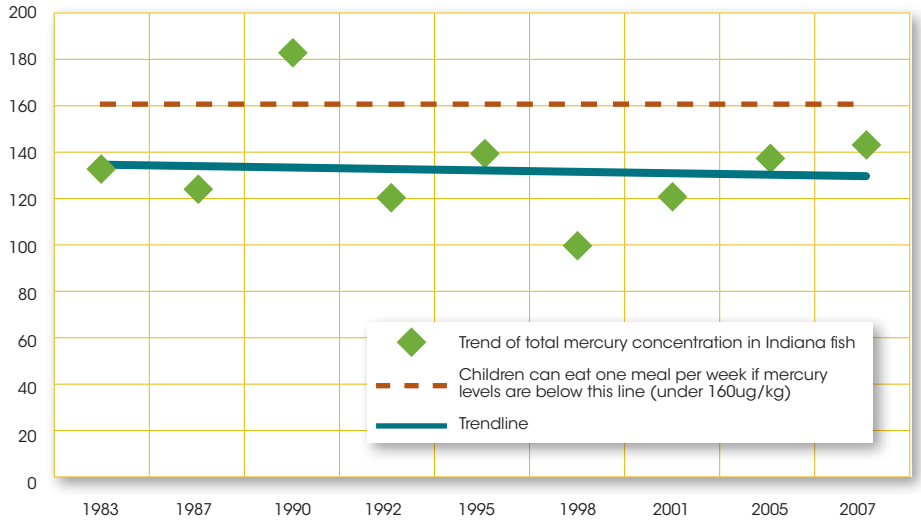
Mercury, which damages the brain and nervous system of children in the womb, is found naturally in the environment. IDEM has found mercury in 90 percent of all fish tissues sampled in Indiana waterways. Mercury accumulates as it moves up the food chain. Large sport fish, such as largemouth bass and walleye, have the highest concentrations of mercury. Small minnows and sunfish have very low levels compared to these large predators. The largest source of mercury in Indiana's waterways comes not from a water source, but from human-caused air pollution from power plants and industry.[24] New federal regulations will require coal-fired power plants to reduce mercury emissions by 2016, but mercury will persist in our environment for many years to come.

Most Indiana waterways are under a fish consumption advisory due to mercury. To view information about a waterway near you, go to IDEM's website at in.gov/idem/nps/3474.htm. This site contains an interactive map allowing you to find whether an Indiana waterway is safe for fishing, swimming or aquatic life. Indiana is not the only state with high mercury levels in fish. Figure 4-6 below shows that most states in the Midwest and Northeast have a statewide advisory for mercury.

A statewide consumption advisory for mercury does not mean that all Indiana fish have high levels of mercury. Statewide advisories are used to communicate the widespread nature of mercury across species of fish and provide health risk information to the general public. Midwestern states have been leaders in collecting data supporting Fish Consumption Advisories and informing the public in a consistent way across the Great Lakes region.

Figure 4-7 shows that average mercury levels in Indiana fish have remained relatively flat since the 1980s, according to data compiled from IDEM sampling results from 1983-2008. The graph shows median concentrations for all fish in all waters. While the median concentration is below the dotted line, that doesn't mean that all fish are safe for children to eat. See the fish consumption advisory to know if a specific fish from an Indiana waterway is safe to eat.

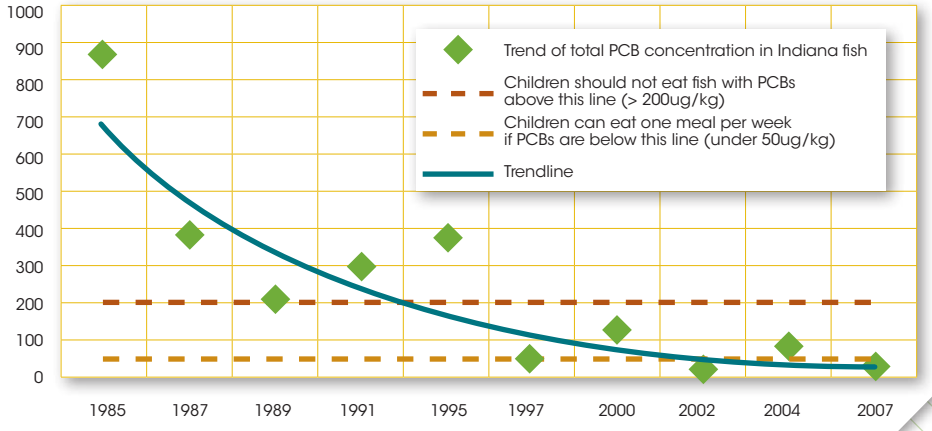
Figure 4-7: Trends of Total Mercury Concentration in Indiana Fish, 1983-2007



PCBs

Unlike mercury, PCBs – polychlorinated biphenyls – are manmade. Polychlorinated biphenyls, or PCBs, were used primarily in the electrical industry as insulators or coolants. They were banned in the 1970's in the United States due to their toxicity, but they persist in the environment today. Studies show that pregnant women exposed to low levels of PCBs had decreased birth weight in their newborns, decreased motor skills in infants and toddlers, and negative effects on short-term memory and IQ scores in young children.[25] PCBs are still found in older products, such as fluorescent lighting fixtures, old hydraulic oils and electrical devices using PCB capacitors. PCBs remain persistent in Indiana's fish, but Figure 4-8 shows their levels have been declining since PCBs were banned in 1979.

Figure 4-8: PCB Concentrations in Indiana Fish Tissue, 1986-2008



Source: Indiana Department of Environmental Management

Table 4-1: 2011 Blue-Green Algae Health Alerts

Waterway	"Public Beach or Sampling Location"	High Risk Health Alerts (above 100,000 cells/mL)
Cecil M. Hardin Reservoir	Raccoon Lake State Recreation Area	4
Hardy Lake	Hardy Lake State Recreation Area	4
Lake James	Pokagon State Park	0
Lake Mississinewa	Miami State Recreation Area	0
Long Lake		0
Monroe Reservoir	Paynetown State Recreation Area	4
Monroe Reservoir	Fairfax State Recreation Area	2
Monroe Reservoir	Hardin Ridge U.S. Forest Service Recreation Area	2
Raccoon Lake	Raccoon Lake State Recreation Area	0
Salamonie Reservoir	Lost Bridge West State Recreation Area	2
Sand Lake	Chain 'O Lakes State Park	1
Summit Lake	Summit Lake State Park	0
Whitewater Lake	Whitewater Memorial State Park	1
Worster Lake	Potato Creek State Park	5

Source: Indiana Department of Environmental Management

Algae Growth

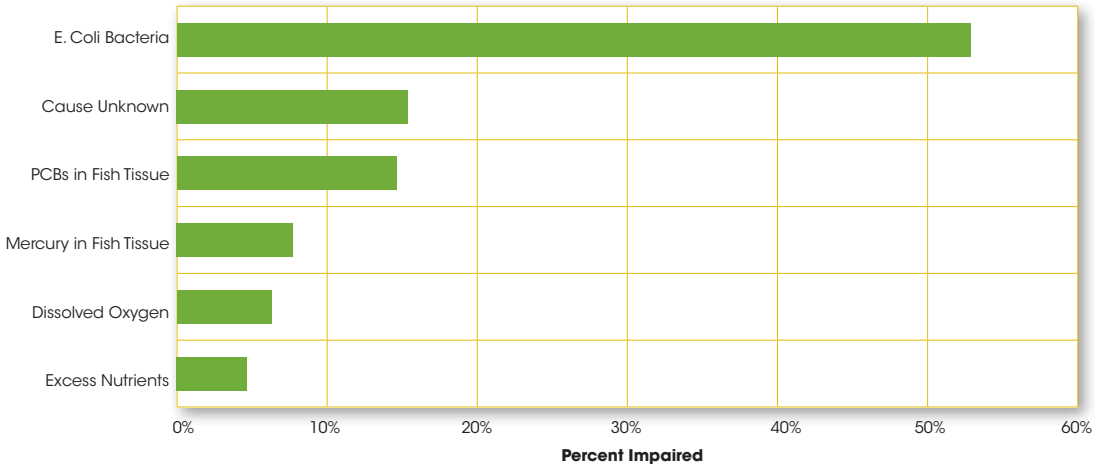
Algae growth is another problem identified in Indiana's lakes, ponds and reservoirs. Algae naturally occur in the water, but large algal blooms can create problems for drinking water and recreation. Algae are fed by warm temperatures and runoff carrying fertilizers or human or animal waste.

A growing concern in Indiana is blue-green algae, which are bacteria that may grow in many types of water. Some species produce toxins that are harmful to humans and animals. Late in the summer of 2007, ISDH issued a health advisory limiting recreational use on Geist Reservoir based on high concentrations of potentially toxic blue-green algae. Blue-green algae are of particular concern when found in reservoirs used for drinking water supply, boating and swimming. While not always visible, blue-green algae can form "blooms" that look like foam, scum or mats of algae on the surface. These blooms are most likely to form in warm, slow-moving waters that contain fertilizer runoff or septic tank overflows.

Exposure to blue-green algae – also known as cyanobacteria – can occur through skin contact, inhaling water droplets and swallowing water that contains blue-green algae. People who swim, wade or water ski in waters affected by some blue-green algal toxins can suffer from rashes, skin or eye irritation, nausea, stomach aches, and tingling in fingers and toes. Other blue-green algaltoxins can cause liver poisoning, kidney poisoning, and neurotoxicity. Children swimming or wading in lakes and reservoirs, especially during summer months, face higher risks because they will be exposed to a larger dose of toxin for their body weight.[26] IDEM recommends that people wash off after swimming in these waters and avoid areas with heavy concentrations of algae.

During the summer, IDEM monitors blue-green algae levels at swimming beaches at selected state parks and reservoirs. The Indiana State Department of Health recommends a high-risk health alert when levels get above 100,000 cells per milliliter. During the summer of 2011, high-risk alerts were issued at some point for nine beaches (Table 4-1). For more information about blue-green algae in Indiana, visit www.algae.in.gov.

Figure 4-9: Top Six Causes of Impairment – Indiana Rivers and Streams 2010

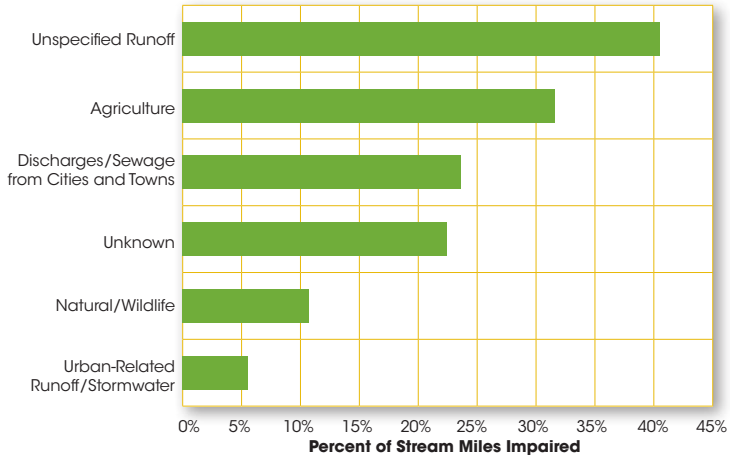


Rivers and Streams

Of the 28,790 river and stream miles assessed by IDEM as of 2012, 71 percent are considered "impaired" because they don't meet one or more of the state's fishable and swimmable goals or they do not adequately support aquatic life.

As shown in Figure 4-9, E.coli bacteria are the most common reason a river or stream is impaired. Other known problems include mercury and PCBs in fish, lack of dissolved oxygen and excess nutrients.

Figure 4-10: Probable Causes of Impaired Rivers and Streams, 2010



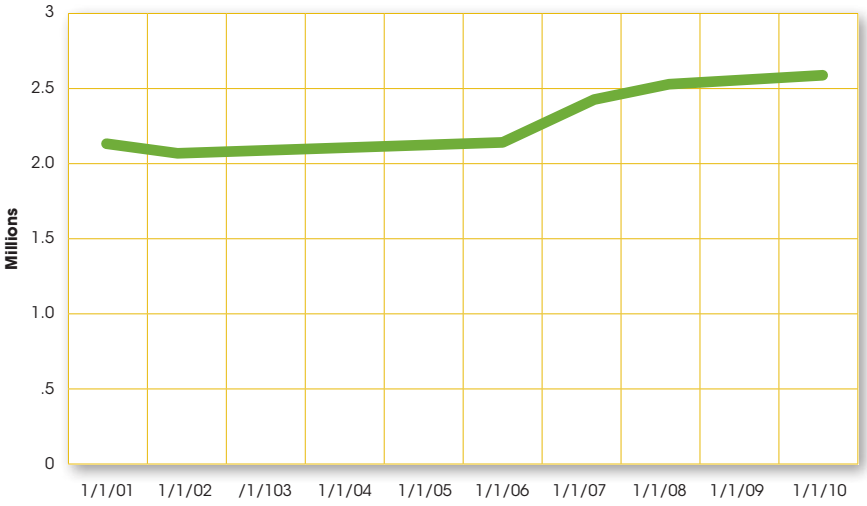
Source: U.S. EPA, Indiana Assessment Data for 2010, accessed at http://iaspub.epa.gov/waters10/attains_state.report_control?p_state=IN&p_cycle=2010&p_report_type=A

E.coli Bacteria

E.coli provides an indication that water contains untreated human or animal waste. Human sewage can carry many other pathogens that can cause illness, especially in young children. When rain falls or snow melts, untreated waste may wash into creeks, rivers, streams or lakes. Children can be exposed to E.coli if they swim or play in these waters, or use them as a source of untreated drinking water. Taking in too much of certain strains of E. coli or other pathogens can cause severe diarrhea and stomach cramps. E.coli can also contribute to ear, eye, nose or throat infections. Figure 4-10 shows probable causes of impaired streams in Indiana, including those with elevated bacteria. According to IDEM's 2010 assessment, the most prominent cause of impaired streams was "unspecified runoff" – rainwater running off the ground and into waterways, followed by agriculture and sewage-related discharges or runoff from cities and towns. Some causes are unknown, while others come from wildlife and other natural sources.

Runoff: Both urban and agricultural runoff can carry bacteria and pathogens into a waterway. Pets and farm animals generate waste, which, if handled or stored improperly, can end up in waterways. Runoff also carries waste from ducks, geese, deer and other wildlife into our waterways. However, there are no good statewide data on pathogens in rainwater runoff throughout Indiana.

Figure 4-11: Total Animal Units on Regulated Farms in Indiana: 2001-2010

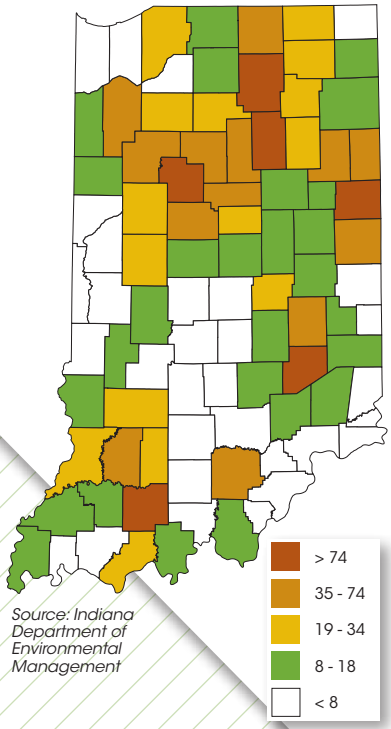


Source: Indiana Department of Environmental Management

Runoff is the most difficult type of water pollution to control, since it comes from virtually every acre of land in Indiana. Some communities are implementing controls that can capture and treat stormwater runoff, or let it percolate into the ground rather than running straight into a waterway. Rain gardens, green roofs, permeable pavement and other "green infrastructure" can be used to slow down runoff and remove pollutants using vegetation, soils and natural processes.

Agriculture: Indiana is a farming state, with 62,000 farms and nearly 15 million acres of farmland covering about 63 percent of the state's total land area.[27] A major pork producing state, Indiana has 3.65 million hogs producing 5 percent of the nation's pork each year. In the past 50-60 years, farming has changed from small farms raising a few animals of several species to larger farms known as confined feeding operations (CFOs), which generally raise large numbers of a single animal species.

Figure 4-12: IDEM Regulated Confined Feeding Farms by County, 2011



Source: Indiana Department of Environmental Management

IDEM designates farms as CFOs when they maintain large numbers of animals in buildings, barns or outdoor lots covered with less than 50 percent vegetation. The number of animals is based on species, since this determines the land size and controls needed to safely apply their manure to surrounding fields. CFOs are defined as farms with at least 300 cattle, 600 swine or sheep, or 30,000 poultry.[28] Figure 4-11 shows that the number of animals housed in CFOs had risen to more than 2.5 million animal units by January 2010. An "animal unit" is the equivalent of a 1,000 pound cow. It takes 2.5 hogs or 30 laying chickens to equal one animal unit.

Confined feeding operations collect manure and wastewater and store it in pits, tanks, lagoons and other storage devices. The manure is then applied to area fields as fertilizer. When stored and applied properly, manure can provide a natural source of nutrients for crop production. Improperly operated confined feeding operations, however, can also harm the environment:

- Manure can leak or spill from storage pits, lagoons or tanks
- Improper application of manure to the land can contaminate local rivers and streams and groundwater

New manure application rules for large farms were passed by the Indiana Water Pollution Control Board and go into effect in July 2012. They will restrict land application of manure based on phosphorus limits and land application to frozen or snow-covered ground. Some farms will be required to get individual permits. IDEM data from July 2011 show that most confined feeding operations were concentrated in the north-central region of the state, as shown in Figure 4-12. Counties with 50 or more CFOs in July 2011 were:

Dubois	103	Decatur	75
Carroll	100	Daviess	64
Jay	88	Adams	63
Wabash	80	White	63
Kosciusko	75	Rush	50

Some scientists also have raised concern that the routine use of antibiotics in confined animal feed is contributing to the spread of antibiotic-resistant bacteria.[29] Antibiotics are fed to animals not just to treat disease, but to prevent disease and promote growth in animals confined closely together. A federal judge ruled in March 2012 that the U.S. Food and Drug Administration must decide whether this practice is a threat to human health and, therefore, should be banned.[30] The FDA in April 2012 announced a voluntary initiative to encourage veterinarians and farmers to use certain antibiotics only to control disease and health problems.[31]

Municipal Sewage Discharges: Untreated human sewage carries dangerous pathogens and diseases. One of the great public health advances of the 20th Century was the invention of modern water and sewage treatment, which put an end to cholera, dysentery and other sewage-borne diseases in developed countries throughout the world. Unfortunately, even today in the 21st Century, untreated human sewage enters Indiana's rivers and streams – often because our sewage infrastructure is inadequate, poorly designed or poorly maintained.

Sewer Overflows: More than 100 Indiana communities have systems that transport sewage and storm water through the same pipes. These are called combined sewer systems and were common practice prior to the 1970s. When it rains, combined systems can overflow and release excess storm water and untreated sewage into nearby waterways, known as a combined sewer overflow (CSO). Federal law requires these communities to prepare a plan to control CSO discharges. One hundred five of Indiana's 108 CSO communities have begun implementing such plans, or have a legal agreement with IDEM to do so, and 31 communities have completed projects required to reduce or eliminate combined sewer discharges. Figure 4-13 shows where CSO discharges occur in Indiana, with each dot representing an overflow pipe.

Unlike a combined sewer, a sanitary sewer is designed only to carry sewage, and stormwater is carried in separate pipes. However, many sanitary systems overflow on occasion, particularly during very large storms. Sanitary sewer overflows (SSOs) have a variety of causes, including blockages, broken pipes, sewer defects that allow stormwater and groundwater to overload the system, poor sewer system operation and maintenance, power failures, inadequate sewer design and vandalism. The untreated sewage from these overflows can contaminate waterways or back up into basements, causing property damage and threatening public health.[32] Communities are required to report each SSO event, clean up the area, investigate the reasons for the discharge, and take action to prevent them in the future. Due to the nature of SSOs, municipalities find it difficult to report the exact number of gallons released. IDEM has some SSO data available on-line at: www.in.gov/idem/5105.htm

Unsewered Communities: A number of small rural communities rely on either aging individual septic systems or pipes that discharge untreated sewage directly to waterways or drainage ditches. Septic systems are designed to treat sewage from a home or business by letting it percolate through the soil. When septic systems fall into disrepair or reach capacity, the sewage can leak into nearby waterways. In many parts of Indiana, soils are too sandy or full of clay to effectively treat septic system

Figure 4-13: Combined Sewer Discharge Locations in Indiana, 2008

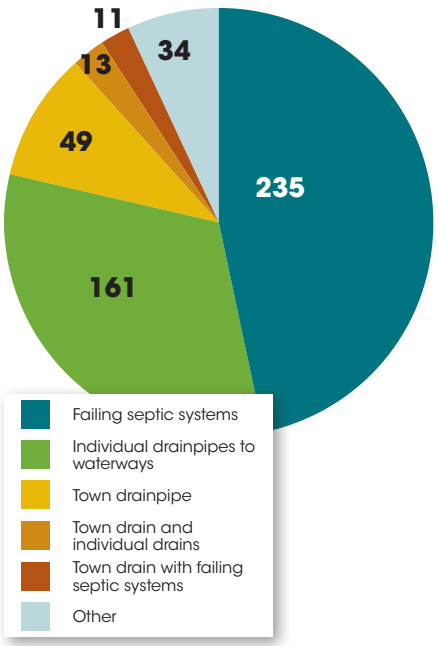
Source: IUPUI Center for Earth and Environmental Science

drainage, and nearby waterways have problems with algae and bacteria. Some individual homes, rural communities and subdivisions have illegal drain pipes that transfer untreated waste directly from septic tanks to a river, lake or drainage ditch.

In 2011, the Indiana State Department of Health and the Indiana Rural Community Assistance Program surveyed county health departments to identify needs of unsewered communities. This survey revealed serious problems in 503 unsewered communities serving more than 47,000 homes and 1,200 businesses. As small as 25 homes and as large as 4,000 homes, these communities include small towns, subdivisions, lakeside communities and other small neighborhoods. Sixty-three percent are in unincorporated areas, although 20 percent fell within incorporated areas or regional sewer districts.

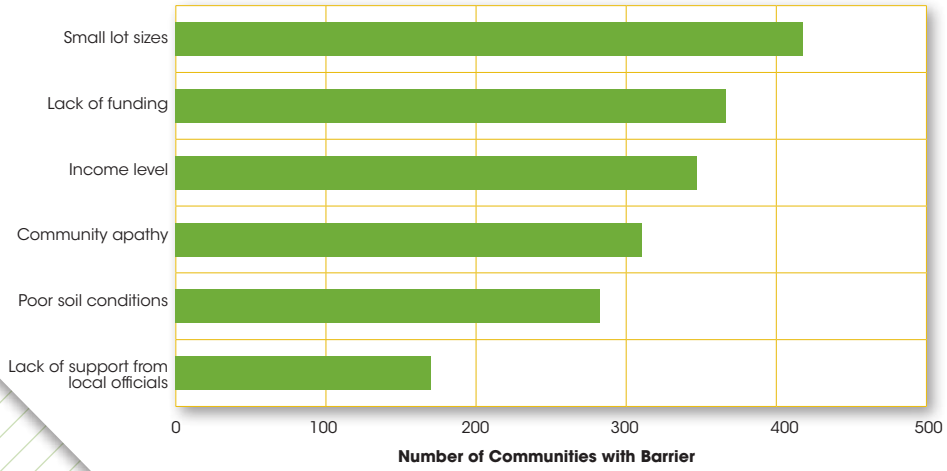
Forty-six percent of these communities had failing septic systems or other failing on-site treatment systems (Figure 4-14). Many are located on poor soils or have lots too small to build a proper septic drainage field. Nearly 15 percent of communities used a "town drain" that discharges untreated sewage directly into a local waterway or ditch, while 35 percent had individual drains from residences or businesses. These pipes are illegal, but still exist due to lack of funding, low incomes and community apathy, according to the survey results (Figure 4-15). Sixty-six percent of these communities get their drinking water from individual wells – wells that, as a result, carry a high risk of contamination with nitrates and bacteria. Often, small lots place drinking water wells too close to the septic system, violating a state rule requiring 50 feet of separation. Fifty-three percent were upstream from an impaired waterway. [33]

Figure 4-14: 2011 Survey of Unsewered Communities: Current Sewage Disposal



Source: Indiana Rural Community Assistance Program

Figure 4-15: 2011 Survey of Unsewered Communities: Barriers to Better Sewage Treatment



For the most part, unsewered communities are small and poor. Indiana has estimated that 88 percent of its unsewered communities have 200 homes or fewer, and 51 percent have fewer than 50 homes. Ninety percent of Indiana residents in unsewered communities earn a low-to-moderate income, and more than 48 percent qualify as "low-income." It is difficult for these communities to afford the needed infrastructure to collect and treat their waste. Unsewered, unwatered communities also have no experience financing, owning, and managing such infrastructure, which makes it difficult for them to organize and implement projects. If they do receive grants or loans to build a small treatment plant, they often lack the expertise, funding and staff to maintain them. In the absence of managerial, technical, and financial capacity, such systems fall into disrepair and may fail or default on their loans.[34]

What Families Need to Know

You can protect your child and your family's health by taking these steps to protect water quality in Indiana:

- Use lawn and garden fertilizers without phosphorous to prevent algae in our waterways.
- Properly dispose of pet waste, which can contain bacteria, viruses, and parasites, and contaminate the environment.
- Have your septic tank regularly checked and emptied to prevent overflows or leaks.
- Do not feed shorebirds. Feeding shorebirds increases waste along shoreline and can contribute to water contamination.
- Find out which beaches are regularly monitored and have posted advisories. Exposure to polluted water is less likely at regularly monitored beaches.
- In areas not monitored regularly, choose swimming sites in less developed areas with good water circulation.
- Avoid swimming at beaches with visible discharge pipes or at urban beaches after a heavy rainfall.
- Don't flush medications down the toilet or pour dangerous chemicals down the drain. Take them to safe disposal sites. Look for hazardous waste dropoff sites at www.indianarecycling.org. Find a place to dispose of unwanted medicine at www.in.gov/recycle/6141.htm

For Information about Your Watershed:

You can view statistics and reports about your local waterways on the EPA website:

http://ofmpub.epa.gov/tmdl_waters10/attains_state.report_control?p_state=IN&p_cycle=2010&p_report_type=A

At IDEM's website, you can also navigate an interactive map showing water quality assessments at Indiana streams and lakes: www.in.gov/idem/nps/3474.htm

Sources

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Chapter 5

Healthy Housing and Neighborhoods

Introduction

Young children spend 80-90 percent of their time indoors – in their own home, a relative's home or a child care facility. We think of a child's home as a safe place, but environmental threats in the home can include lead hazards, mold, secondhand smoke and other indoor air pollutants. A structurally sound, well-maintained home can lead to better health for the children living there.

According to the 2010 U.S. Census, Indiana had nearly 2.8 million housing units, with 10.5 percent of those homes being vacant. This represented an almost 50 percent increase in the amount of vacant homes, compared to 2000. Homeownership is strong in Indiana, with nearly 70 percent of Hoosier housing units occupied by the owner, compared to 65 percent of U.S. homes.

Equally important is the neighborhood where the child's home is located. Is it healthy and safe? Does the child have safe places to play outdoors, or is he surrounded by abandoned homes, vacant properties and contaminated soil? Green space is also important. Research has demonstrated that exposure to parks, nature and trees can improve a child's health:

- Pregnant women living in areas with more trees had better birth outcomes;
- Children's built environments influence their access to nutritious foods and physical activity;
- Children with ADHD who regularly play in natural settings have milder symptoms than children who play in built outdoor and indoor settings;
- Play in natural environments improves kindergarten children's motor abilities; and
- Street trees may help prevent early childhood asthma.[1]

According to the Center for Housing Policy and National Housing Conference, stable, affordable housing may help children succeed in school. For example, well-constructed, maintained, and managed affordable housing can help families address or escape housing-related health hazards, such as lead poisoning and asthma.[2]

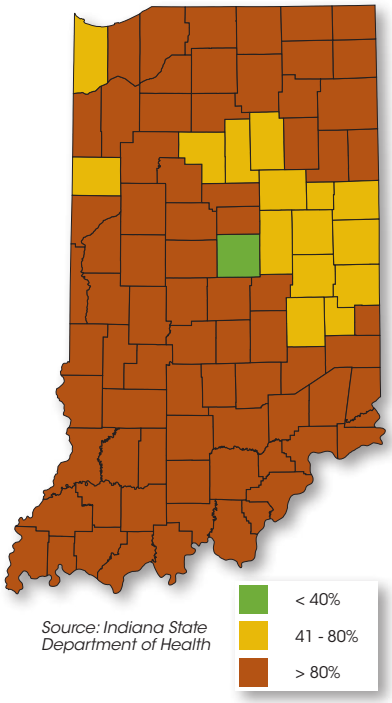
Substandard housing can contribute to student absenteeism, and poorer performance on standardized tests. Poor housing conditions — particularly the persistent presence of cockroaches, pesticides, and mold — can lead to asthma-related absences, even among children whose asthma is mild or moderate. Stable, affordable housing also may reduce a family's need to move frequently, reducing unwanted moves that can disrupt learning and home life.

Unfortunately, we don't have comprehensive data on the condition of housing for families with young children in Indiana. A few indicators of housing health are shown in this section of the report.

Lead Hazards

Since lead paint was banned for residential use in 1978, a key risk factor for lead poisoning is housing built prior to 1978. According to the 2009 American Community Survey estimates, 74 percent of Indiana's available housing was built in 1979 or earlier. Figure 5-1 shows the distribution of pre-1980 housing in Indiana by county, according to the 2009 American Community Survey. Only Hamilton County, shown in green, has less than 40 percent of its housing stock built prior to 1980. Eighty-two percent of Indiana's 92 counties have 41-80 percent of their housing stock built before 1980; 16 counties have more than 80 percent pre-1980 housing.

Figure 5-1: Distribution of Pre-1980 Housing Stock in Indiana



Source: Indiana State Department of Health

Lead paint in good condition may not pose a risk to children in the home, unless it is disturbed through renovation, damage to the paint or normal wear and tear. Disturbance of lead paint can create lead dust, which can be extremely harmful to a young child. Just a few particles of dust from lead-based paint are enough to poison a child. And the effects could last a lifetime.

- Lead dust can be released when painted surfaces rub together, such as when doors, windows or drawers are opened and closed.
- Home improvements that involve scraping, sanding or otherwise disturbing old paint can release toxic lead dust.

A lead inspection or risk assessment can be used to identify actual or potential lead hazards in a home and provide recommendations to reduce those hazards. Unfortunately, these assessments are typically done only when a child has already been lead-poisoned or when a dwelling receives funding through the U.S. Department of Housing and Urban Development. Under federal law, only a lead-safe certified firm may be used in any renovation, repair or painting project that disturbs more than six square feet of interior surface in a pre-1978 home or child-occupied facility. Contractors performing work that disturbs lead-based paint without proper certification and training could face tens of thousands of dollars in fines.

What Families Need to Know

If your home was built before 1978, test your home for lead-based paint and learn about potential lead hazards.

- Keep painted surfaces well-maintained and fix any chipping or peeling paint. Use a lead-safe certified contractor for renovation, repair or painting jobs.
- Keep your home clean and as free of dust as possible – particularly around areas where painted surfaces rub together, such as windows, doors and painted drawers.
- Wipe up any paint chips or visible dust with a wet sponge or rag.
- Hire an EPA lead-safe certified firm before renovating, repairing or painting your home. Find one in your area at www.leadfreekids.org
- If you are a do-it-yourselfer, learn how to work lead-safe at www.epa.gov/lead/pubs/renovaterightbrochure.pdf.
- Wash children's hands, bottles, pacifiers and toys often.
- Teach children to remove their shoes, and wash their hands after playing outdoors.
- Ensure that your family members eat well-balanced meals.[3]

Statewide Data Not Available

The only widely available data on the condition of Indiana housing is the American Housing Survey, conducted by the U.S. Department of Housing and Urban Development. Data for large metropolitan areas are collected through in-person or telephone interviews about every six years. In Indiana, data are only available for the Indianapolis Metropolitan Area, which in 2004 was based on a survey of 4,733 housing units in the nine-county area of Boone, Hamilton, Hancock, Hendricks, Johnson, Madison, Marion, Morgan and Shelby counties. Data on Indiana's remaining 83 counties are not available, although Dearborn County is surveyed periodically because it belongs to the metropolitan area surrounding Cincinnati, Ohio.

According to the 2004 American Housing Survey, about 14 percent of housing in the 9-county Indianapolis area housed children 6 years old or younger. However, the data presented here represent all housing surveyed in the 9-county Indianapolis area, and not just housing where young children live.

Housing Stock

Health is not simply the result of a doctor's visit, but instead begins in children's families, schools, playgrounds, parks, the air they breathe, and the water they drink. Scientists have found that the conditions in which Americans live and work have an enormous impact on our health. Unfortunately, low-income communities are isolated and self-contained on all three levels—physical, psychological, and social. They are often physically isolated in locations that lack resources necessary to live a healthy life.[4]

Poor housing conditions have been associated with poor growth and development in both children and adults. Housing insecurity – defined by crowding or multiple moves during the previous year – is associated with poor health, lower weight, and developmental risk among young children. For example, very young children in households with multiple moves had worse caregiver-reported health status, increased developmental risk, and lower weight than expected for their age.[5] When families with young children lack access to affordable, safe housing, they are more likely to move multiple times or rely on friends or family members to share housing.

Indiana law sets basic requirements for construction of new housing but does not provide minimum health or safety requirements for existing housing. And while the State Health Commissioner and local health officers have general authority to order unhealthy conditions to be remediated or, in extreme cases, to order that housing be vacated, most local health departments do not have clear, specific and adequate authority to order that unhealthful or dangerous conditions in housing be fixed.

How Indianapolis Area Housing Ranks

The National Center for Healthy Housing (NCHH) published a State of Healthy Housing report that compared American Housing Survey data from metropolitan areas around the country. This study ranked the 9-county Indianapolis area 24th out of 45 metro areas for healthy housing. It also compared the central city of Indianapolis to other cities and ranked the health of Indianapolis's housing 19th out of 44 cities.[6] Nationally, the most common housing problems are water leaks from the outside (11%) and inside (8%), roofing problems (6%), damaged interior walls (5%) and signs of mice (5%).

NCHH identified several areas where the Indianapolis area lags behind: "Compared to the national average, Indianapolis has more homes with water leaks from the inside and outside, sewage disposal breakdown, and siding problems. Central city homes were likelier than the national average to have flush toilet breakdowns and rooms without electrical outlets. Areas outside the central city have a higher average for window and foundation problems.[7] Owner-occupied homes had more problems than the national average for open cracks or holes in walls, signs of mice, heating equipment breakdown, and roofing and foundation

problems." On a positive note, compared to the national average, the Indianapolis metro area had fewer homes with signs of rats and fewer room heaters without flues to vent dangerous gases outside.

Table 5-1 compares housing conditions in the entire metropolitan area to those only inside Marion County and in the surrounding counties. Housing in Indianapolis is more likely to have water leaks and flush toilet and sewage disposal breakdowns. Approximately 49 percent of housing units in the City of Indianapolis had some healthy housing problem, compared with 37 percent in surrounding communities.[8]

Table 5-1 Comparison of Housing Data in Indianapolis Metropolitan Area, 2004

	Percent of Surveyed Homes with Problem		
	9-County Metro Area	Marion County	Surrounding Counties
Basic Housing Quality			
Severe physical problems	1.1	1.3	0.9
Moderate physical problems	2.7	4.1	1.5
Interior Problems			
Holes in floors	0.8	1.2	0.4
Open cracks or holes in walls	5.3	6.7	4
Broken plaster/peeling paint	2	2.7	1.3
Signs of rats	0.3	0.5	0.1
Signs of mice	5.8	6.7	5
Water leaks from inside	10.5	12.8	8.5
Water leaks from outside	16.7	19	14.7
Water supply stoppage	3.3	3.2	3.4
Flush toilet breakdown	2.5	3.7	1.5
Sewage disposal breakdown	2.2	2.9	1.5
Lacking complete plumbing	0.7	0.9	0.6
Heating equipment breakdown	3.2	3.4	3.1
Room heater without flue	0.4	0.2	0.5
Exposed wiring in unit	0.4	0.5	0.2
Rooms without working elect. outlet	1.7	2.4	1.1
Lacking kitchen facilities	1.3	2.1	0.6
Exterior Problems			
Roofing problems	6	7.2	5
Siding problems	3.9	4.9	3
Window problems	4.9	5.4	4.4
Foundation problems	2.6	2.7	2.5
Any Identified Problem	42.6	48.7	37.2

Source: National Center for Healthy Housing. State of Healthy Housing. Accessed at: http://www.nchh.org/Policy/State-of-Healthy-Housing/Location-Summary/tabid/346/msa/18/Default.aspx

Structural Conditions

Structural defects – such as missing shingles, holes in the roof, broken windows and crumbling foundations – can create moisture problems and invite pests into a home. Moisture in the home can lead to mold, a common cause of asthma attacks and allergies. Pests can shed allergens or lead to the misuse of pesticides – risk factors that can trigger asthma attacks and other health problems in children. Uncontrolled moisture can also damage drywall and other surfaces where lead-based paint might be present, causing the paint to peel, chip and fall onto floors, yards and windowsills.

According to the 2004 American Housing Survey for the 9-county Indianapolis metro area, structural problems such as missing roofing material, holes in the roof, broken windows and foundation defects were found in less than 5 percent of the housing units surveyed (Figure 5-2). However, families living below the poverty level had more than twice the roofing defects when compared to the entire 9-county area. Broken windows and foundation defects were also more likely to be found in low-income homes than in others.[9]

Figure 5-2: External Building Conditions – Indianapolis Metropolitan Area, 2004

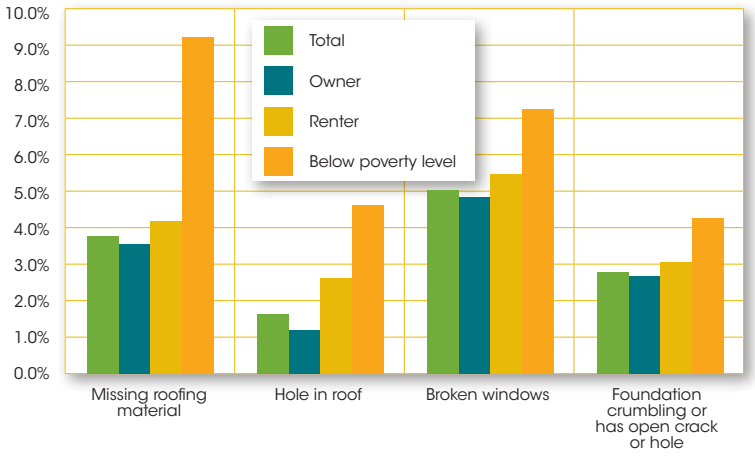
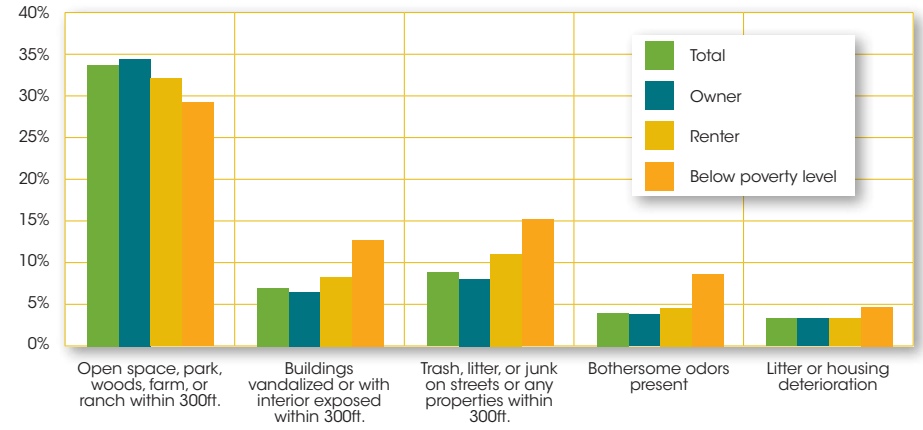


Figure 5-3: Neighborhood Conditions – Indianapolis Metropolitan Area, 2004



Source: American Housing Survey for Indianapolis, IN Metropolitan Area, 2004

Families living below the poverty level are more likely to live in homes with structural problems and undesirable neighborhood conditions. Poverty thresholds are set by the U.S. Department of Agriculture and are based on income and the number of people living in the household. In 2004, the poverty threshold for a family of two adults and two children was an annual income below $19,157.

Neighborhood Conditions

The health of a neighborhood can influence whether it is safe for a child to play outside. Neighborhoods with persistent odors, littering, abandoned homes and housing deterioration make it unsafe or unhealthy for children to play and explore the outdoor environment, even when their parents or other caregivers are present. Conversely, neighborhoods with open space, parks or woods can give children more opportunities to play in nature and green space.

Families living below the poverty level in the Indianapolis metro area are more likely to report bothersome odors, vandalized buildings, litter or housing deterioration within 300 feet of their home, as shown in Figure 5-3.[10] Low-income families also are less likely to live near open space, parks or woods. Bothersome neighborhood conditions also are more likely to be found near rental properties than owner-occupied homes.

Rural, suburban and urban neighborhoods can present vastly different environments for a young child to grow up. Unfortunately, the American Housing Survey does not provide data specific to Indiana's rural areas.

Internal Housing Defects

Maintenance problems inside the home can also contribute to unhealthy conditions. Open cracks or holes in walls can contribute to moisture and pest problems. Broken plaster or peeling paint can contain lead hazards for a young child. Holes in floors can harbor pests or pose a safety hazard to a young child just learning to walk. Water leaks contribute to mold and peeling paint.

As shown in Figure 5-4, open cracks or holes inside a home were the most common interior maintenance problems found in Indianapolis area housing. Cracks, holes, broken plaster and peeling paint are more likely to be found in housing for renters and families living below poverty than in owner-occupied housing.[11]

Water leakage was a frequent occurrence in all housing categories in the Indianapolis area, as shown in Figure 5-5.[12,13] Water leakage can come from both inside and outside the building. The most common areas where water leaks enter a home are the roof, basement, walls, closed windows or doors. The most common internal sources are leaking pipes and plumbing backups or overflows. Water leakage affects all income levels and both owners and renters.

Rodents can contribute to disease and asthma attacks. Mice were sighted more frequently than rats in all housing categories; both were more likely to be found in homes where families lived below the poverty level.[14] The survey counted actual sightings of mice or rats or signs of them inside the house or building during the previous 3 months. Signs of mice and rats include droppings, holes in the wall, or ripped or torn food containers.

Figure 5-4: Internal Housing Defects – Indianapolis Metropolitan Area, 2004

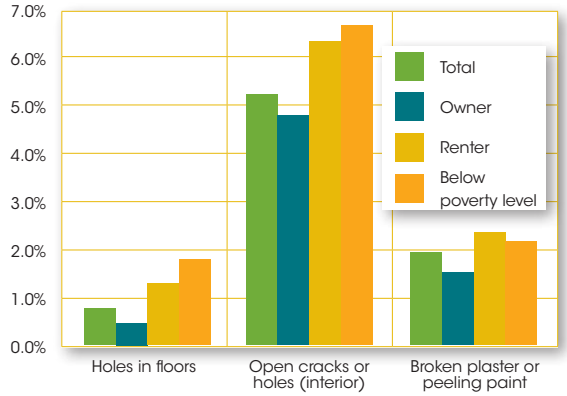
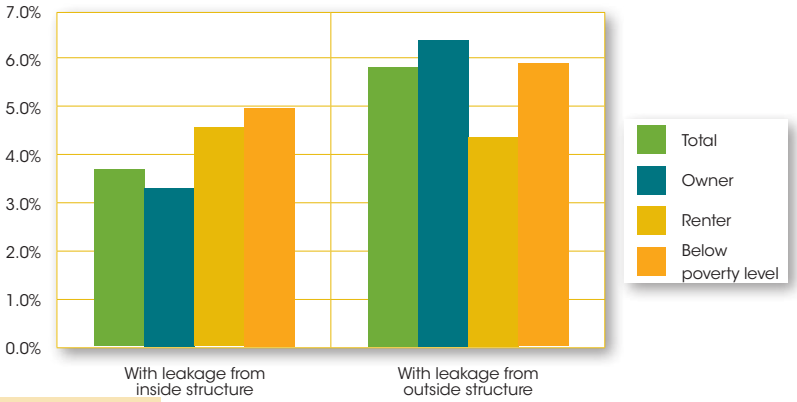


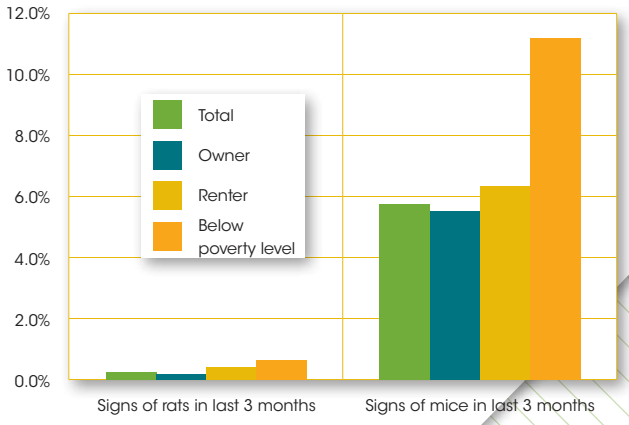
Figure 5-5: Water Leakage in Housing – Indianapolis Metropolitan Area, 2004



What Families Need to Know

1. **Maintain Your Home:** Keeping your home well-maintained will improve your family's health. Follow the Seven Principles for a Healthy Home found at the end of this chapter. Low and moderate-income Hoosiers may qualify for home improvement assistance from various government and non-profit programs. Visit this link to find one in your area: http://portal.hud.gov/hudportal/HUD?src=/states/indiana/homeownership/homerepairs
2. **Know Your Rights as a Renter:** If you rent your home, your landlord is responsible for providing a safe and healthy home for you and your family. Learn more about your rights as a tenant at this link: http://portal.hud.gov/hudportal/HUD?src=/states/indiana/renting/tenantrights/klerch
3. **Support Stronger Local Housing Codes:** Most Indiana counties and cities lack an adequate housing code to ensure that existing housing meets basic health and safety requirements. Improving Kids' Environment has developed a Model Healthy Homes Code from which local governments can develop their own codes. To learn more, visit ikecoalition.org/healthy_homes.

Figure 5-6: – Signs of Rodents in Housing – Indianapolis Metropolitan Area, 2004



Source: American Housing Survey for Indianapolis, IN Metropolitan Area, 2004

What Families Need to Know

Prevent Suffocation: Always place your baby to sleep on his back and on a firm sleep surface. Keep pillows, stuffed toys, loose bedding, or any soft objects out of the crib. Don't sleep in the same bed as your baby. Babies who sleep in the same bed as their parents are at risk of SIDS, suffocation, or strangulation. Make sure your baby is immunized and keep him away from smokers.

Be Safe Around Fire: Keep matches and lighters away from children. Don't leave the kitchen while cooking. Have your furnace inspected each year. Install screens on fireplaces and wood stoves and dispose of ashes in metal containers after they've cooled. Keep candles out of reach of children and pets, and don't leave a lit candle unattended. Keep a fire extinguisher in high risk areas, such as the kitchen and furnace room. Install smoke alarms and replace batteries once a year. Have an escape plan and share it with your children. Teach children about fire safety at www.survivealive.org.

Prevent Poisonings: Lock chemicals and potential poisons way from children's reach. Keep products in their original containers. Swallow medicine out of sight of children and never call medicine "candy." Keep the Indiana Poison Prevention hotline number next to all phones in your house: 800-222-1222. If the person who is poisoned can't wake up, is having trouble breathing or is having seizures, call 911.

Prevent Falls and Brain Injury: Do not place toys or items that attract children on top of furniture. Place furniture away from windows. Secure heavy furniture and TVs to the wall with anchor straps. Install safety gates at the top and the bottom of staircases. Hold a toddler's hands when climbing up or down stairs. Keep windows locked when they're closed. Keep infants strapped into high chairs, baby carriers, swings and strollers. Learn more at www.safekids.org.

Prevent Traffic Injuries: Always put young children in car seats and make sure they are fastened correctly and securely. Four out of five child car seats are used improperly. Children should be kept in a 5-point harness until they are 4 years old or weight 40 pounds. Keep infants rear-facing as long as possible. Make sure children wear a helmet when riding a bicycle. Learn more at www.preventinjury.org

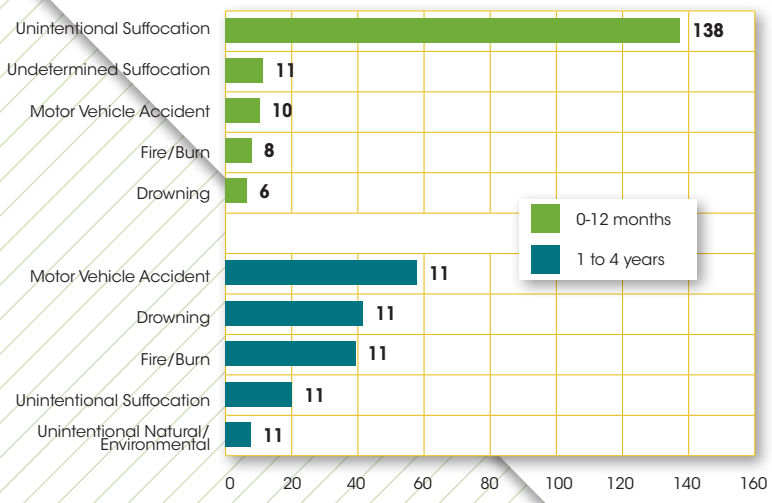
You can find many more tips about making your home safe for young children at www.safekids.org.

Childhood Injuries

According to the Centers for Disease Control and Prevention (CDC), in 2006, injury was the fifth leading cause of death in the United States and the leading cause of death for children and young adults between 1 and 44 years of age.[15]

Infants (age 0-12 months) are at greater risk for many injuries because they are completely dependent on adults for their care. They also are less able to identify and avoid unsafe environments. From 2003 to 2006, 227 infants died in Indiana due to unintentional and intentional injuries. More than two-thirds of all injury-related infant deaths were due to suffocation (Figure 5-7). The rate of injury death for black infants was 175.7 per 100,000, more than three times higher than the rate for white infants (53.4 per 100,000).

Figure 5-7: Five Leading Causes of Injury-Related Death, Age 0-4 in Indiana, 2003-2006



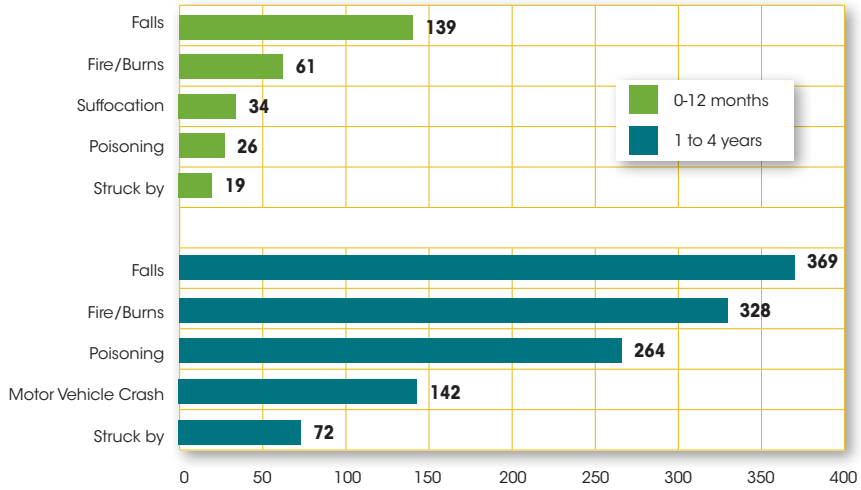
Source: Table 7, ISDH Indiana Injury Report, 2003-06

Preschool children (age 1-4) are also at greater risk of injury. Young children are naturally curious and like to explore their environment. At the same time, they lack judgment and coordination, making them prone to falls and accidents. Preschool children accounted for more than half of Indiana's fatal injuries from motor vehicle accidents and drowning in 2003-2006. Fires and suffocation are also common causes of injury-related deaths for children age 1 to 4.[16] Suffocation includes choking on

food or other objects that cut off breathing, as well as strangulation and suffocation by plastic bags or bedding.

Hospitalizations: Each year, hundreds of Indiana children are hospitalized due to injury. Injuries accounted for more than half of hospital inpatient admissions in Indiana in 2003-06 for ages 1-4. Falls were the primary cause of hospital admissions for infants during this time period, accounting for 25.6 percent of all infant hospitalizations.[17] The top three causes of hospital admissions for 1-4 year olds in 2003-06 were falls, fire and poisoning. Falls accounted for 23.2 percent of hospitalizations, followed by fire with 20.6 percent and poisoning at 16.6 percent. Figure 5-8 shows the leading causes of injury-related hospitalizations in Indiana from 2003-06 for children age 0-4. The fifth leading cause of hospital admissions for Age 1-4, "Struck by," refers to being struck by or against a human, animal, or object other than a vehicle or machinery.

Figure 5-8: Five Leading Causes of Injury-Related Hospital Admissions, Age 0-4 in Indiana, 2003-2006



Source: Table 7, ISDH Indiana Injury Report, 2003-2006

Programs to reduce childhood injuries have been demonstrated to yield significant benefits:

• Child safety seat distribution, at a cost of $46 per seat, yields a total benefit to society[18] of $1,900 per seat (Children's Safety Network, 2005).

• At a cost of $10 per child, counseling by a physician on injury prevention yields a total benefit to society of $86 (Children's Safety Network, 2005).[19]

Seven Principles of a Healthy Home

The National Center for Healthy Housing has identified seven guidlines for creating a safe and healthy home. By following these principles, you can reduce allergens, chemical exposures, safety hazards and indoor air pollution. Learn more at www.nchh.org.

• **Keep it Dry:** Damp houses are inviting environments for mites, roaches, rodents, and molds, all of which are associated with asthma.

• **Keep it Clean:** Clean homes help reduce pest infestations and exposure to contaminants.

• **Keep it Pest-Free:** Recent studies show a link between exposure to mice and cockroaches and asthma episodes in children; yet using pesticides improperly can also cause health problems, since chemical exposures can cause neurological damage and cancer.

• **Keep it Safe:** Most childhood injuries happen in the home. Falls are the most frequent cause, followed by injuries from objects in the home, burns, and poisonings.

• **Keep it Contaminant-Free:** Chemical exposures include lead, radon, pesticides, volatile organic compounds, and tobacco smoke. Concentrations of asbestos particles, radon gas, carbon monoxide, and second-hand tobacco smoke are far higher indoors than outside.

• **Keep it Ventilated:** Increasing the fresh air supply in a home improves the health of your lungs.

• **Keep it Maintained:** Poorly-maintained homes are at risk for moisture and pest problems. Deteriorated lead-based paint in older housing is the primary cause of lead poisoning, which affects some 240,000 U.S. children.

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Chapter 6

Healthy Child Care

Introduction

High-quality early childhood programs help children achieve later success in school, work and life. From birth through age 5, a child's brain is developing and building connections in response to the child's experiences and environment. The child care environment needs to be safe, healthy and filled with opportunities to learn and grow.

Studies indicate parents consider a number of factors when choosing child care, including their own family values and what's available in their community. In numerous studies, parents rank safety, caregiver warmth, and support of learning as most important. Parents also take into account practical considerations such as cost and convenience. Their options also are limited to what is available within a manageable distance from home or work. Families in rural and other sparsely populated communities typically have fewer options.[1]

According to the National Association of Child Care Resource and Referral Agencies (NACCRRA), in 2011 Indiana had 327,253 children younger than age 6 needing child care while one or both parents worked. Child care facilities had space for approximately 233,500 children. Remaining children likely were cared for by relatives or other caregivers in a home-based setting.

Indiana categorizes regulated child care facilities into three main groups:

- Licensed child care centers
- Licensed child care homes (home-based child care businesses caring for at least six children not related to the business owner)
- Unlicensed, registered child care ministries (day care provided as an extension of a tax-exempt church or religious ministry)

These categories do not include license-exempt providers, such as licensed exempt home child care providers, part-time programs such as preschools and parent day out programs, and before- and after-school programs. License-exempt providers that accept federal Child Care and Development Fund (CCDF) revenue must meet certain eligibility standards even though they are not licensed.

A Healthy Child Care Environment

The child care setting can contain the same types of indoor and outdoor environmental health issues as a child's home. The American Academy of Pediatrics (AAP) notes that, when it comes to environmental hazards in child care settings, parents should be most concerned about indoor air quality, secondhand smoke, lead, and pesticides.

Indoor Air. Indoor air pollution concerns include carbon monoxide, secondhand tobacco smoke, molds, and volatile organic compounds. Indoor air hasn't been studied in Indiana, but in rural counties of New York State, a study of child care facilities observed high levels of pollutants such as lead, radon, carbon monoxide, asbestos, and mold.[2]

Lead. Children can also be exposed to lead in the child care setting. The First National Environmental Health Survey of Child Care Centers, published in 2005, surveyed 168 licensed randomly selected child care facilities to measure lead in soil and dust samples. Twenty-eight percent of the surveyed facilities contained lead-based paint, and 14 percent contained one or more significant lead-based hazards. Facilities in which most children were black were four times more likely to have significant lead-based paint hazards than facilities where the majority of children were white.[3]

Pesticides. Children are highly vulnerable to pesticides. The first national survey of pesticide exposures in child care facilities found between one and 10 pesticides in 63 percent of surveyed centers. Pesticides were applied as often as 107 times annually in one center. In Colorado, health inspectors found that toxic chemicals were accessible to children in 68 percent of child care settings. According to the American Academy of Pediatrics, pesticides are not safe to use in child care settings. Parents should ask about the type of pesticides and other chemicals used in their child's child care facility.[4]

Child Care Standards

Parents have little control or knowledge of what goes on in a child care facility when they are not there. The American Public Health Association and American Academy of Pediatrics (AAP) recommend that child care settings be required to meet standards published in Caring for Our Children: National Health and Safety Performance Standards—Guidelines for Out-of-Home Child Care Programs.[5]

Not all child care facilities in Indiana meet these standards. In Indiana, safety standards for child care facilities depend upon the type of facility, with licensed centers having to meet the most stringent requirements and registered ministries facing the fewest requirements for ensuring health and safety of children. License-exempt providers have no requirements, unless they accept CCDF funding. Some examples:

Tobacco Smoke: Indiana does not allow smoking in licensed child care centers and child care homes when children are present, but registered ministries and legally licensed exempt facilities may allow smoking by staff or visitors, unless they accept CCDF funding.[6]

Chemicals: In licensed centers, poisons, chemicals, and any item that states "fatal if swallowed" must be in locked storage and not accessible to children. In child care homes, the caregiver is required to keep poisonous or hazardous materials that would harm children in "areas inaccessible to children," but the materials are not required to be locked up. There are no such requirements for child care ministries or legally licensed exempt child cares, unless they accept CCDF funding.

Pesticides: In licensed centers, chemicals for lawn care and insect and rodent control may not be applied when children are present in the child care center. There are no such requirements for child care homes or ministries. The Indiana Pesticide Review Board passed a rule in 2010 restricting the use of pesticides in K-12 schools, but there is no similar rule for child care facilities. The Board does have a voluntary policy that they encourage facilities to adopt. Other states, such as Illinois, have begun requiring integrated pest management in child care facilities to reduce exposure to pesticides. For more information about safer pest control alternatives, visit Purdue University's IPM School Technical Resource Center at http://extension.entm.purdue.edu/schoolipm/1kid/kid1.htm

Peeling Paint: Peeling paint and paint dust can be a sign of lead-based paint hazards in facility built before 1978. Licensed centers must make peeling paint inaccessible to children until the material is tested for lead. Child care homes and ministries do not have to test peeling paint for lead, although a state inspector can cite them for peeling paint under general requirement that facilities must be structurally sound, in good repair and maintained in a clean, safe, and sanitary condition.[7]

Rodents and Roaches: Child care centers must report rodents and roaches to the state and to parents and take steps to remove them. Child care homes and ministries do not have to report these health hazards to the state or parents, but can be cited by a state inspector for failing to maintain facilities in a clean, safe and sanitary condition.[8] The state can shut down licensed home providers until the infestation has been dealt with.

Parents choosing a child care facility should ask questions about these issues before enrolling their child. See a suggested list of questions at the end of this chapter.

Most Common Violations

Licensed and registered child care facilities are subject to scheduled and random inspections by staff from the Indiana Family and Social Services Administration (FSSA) Bureau of Child Care. Table 6-1 shows the most common citations given to child care facilities in Indiana in 2011. Several of the most common citations involve the health and safety of the child care facility.

Parents can search for violations at a specific child care facility at www.childcareindiana.org.

Table 6-1 Most Common Citations in Indiana's Regulated Child Care Facilities, 2011	
Licensed Child Care Centers	**No.**
Failure to document that all staff were free of tuberculosis	137
Failure to follow guidelines for assembling, installing and anchoring playground equipment	130
Failure to store cleaning equipment, cleaning agents, aerosol cans and other dangerous items in a place inaccessible to children	127
Failure to maintain all interior and exterior surfaces in a safe condition, free of sharp points or jagged edges, splinters, protruding nails or wires, loose parts, rusty parts, or materials containing poisonous substances	104
Failure to keep complete admission records for each child	101
Licensed Child Care Homes	
Failure to document that caregivers and adult family members were free of tuberculosis	584
Failure to maintain documentation of certification of a current first aid course, training in Universal Precautions, and annual CPR certification by direct child care providers	469
Failure to have a written statement signed by a physician or a certified nurse practitioner allowing the child to participate in the child care home's activities	452
Failure to have required fire extinguishers	356
Failure to have physical examination and tuberculosis tests on all child care providers and household members having direct contact with children.	355
Registered Ministries	
Failure to maintain interior surfaces, equipment, materials, furnishings, and objects with which children will come in contact in a clean and sanitary condition, and of nontoxic durable construction	569
Failure to meet standards for restrooms (i.e., flush toilets with toilet paper dispensers, handwashing sinks, adequate water, soap and disposable paper towels in dispensers.)	254
Failure to conduct diapering in a clean and sanitary manner.	233
Employing a person or volunteer who has a history of child abuse or neglect	227
Failure to have proof of each child's immunization against whooping cough.	225
Source: Indiana Family and Social Services Administration, Bureau of Child Care	

Paths to QUALITY™

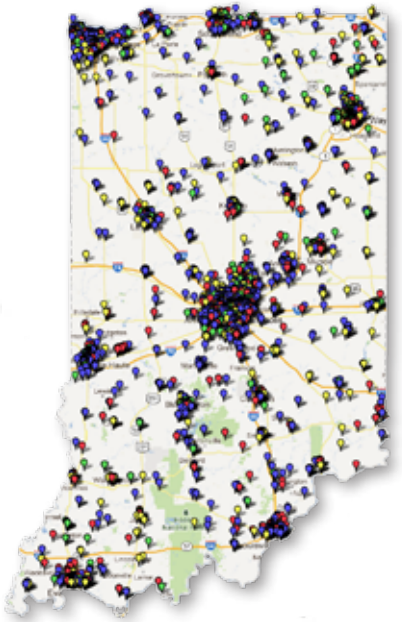
In order to improve the quality of child care programs, Indiana established a quality rating and improvement system known as Paths to QUALITY™. More than 2,000 child care programs serving 83,000 children have voluntarily joined this system, which gives families an easy-to-recognize tool for evaluating child care programs.

Paths to QUALITY™ has four levels. Starting with Level 1, child care programs must meet basic health and safety standards. They may progress to the highest level, Level 4, achieving national accreditation. The four levels indicate:

- **Level One:**
  Health and safety needs of children met.
- **Level Two:**
  Environment supports children's learning.
- **Level Three:**
  Planned curriculum guides child development and school readiness.
- **Level Four:**
  National accreditation (the highest indicator of quality) is achieved.

Level One is the only level with requirements related to the child care environment (health, safety, food and nutrition). The requirements include keeping harmful poisons and chemicals in a locked janitor's closet and keeping other cleaning supplies and hazardous materials out of children's reach. However, Paths to Quality does not have requirements to ensure a facility is lead-safe, has healthy indoor air quality or does not apply pesticides when children are present. For more information on Paths to QUALITY™ please visit the http://www.childcareindiana.org website.

Figure 6-1: Paths to Quality Facilities in Indiana, 2012



Source: Indiana Association for Child Care Resource & Referral

The map in Figure 6-1 shows where Paths to Quality facilities are located throughout Indiana. The map indicates the level of each facility as of February 2012 by color:

Level 1 = Blue
Level 2 = Red
Level 3 = Yellow
Level 4 = Green

You can also search on-line for a specific facility at www.childcareindiana.org or use the interactive map at http://rac.iaccrr.org/map/ptq_map.htm

Voluntary Program: IDEM Five-Star Environmental Recognition Program

Another voluntary program does recognize child care facilities that have taken extra steps to create a safe and healthy environment for Indiana children. The Indiana Department of Environmental Management's Five-Star Environmental Recognition Program for Child Care Facilities helps parents select an environmentally healthy child care; one that promotes healthy development in young children free from pesticides, harmful chemicals, lead paint hazards, radon, and other often invisible environmental health threats.

In order to achieve recognition, child care facilities must submit an application and must pass review by IDEM staff and a review committee. Each facility director decides how many stars to apply for.

As of February 2012, 86 child care facilities in Indiana had achieved recognition through IDEM's program. Figure 6-2 below shows where they are located. Because there are only a few facilities that have achieved this recognition, many parents do not have access to the peace of mind a 5-Star rating can provide. For more information, including a complete list of requirements, visit the program website at www.in.gov/idem/childcare

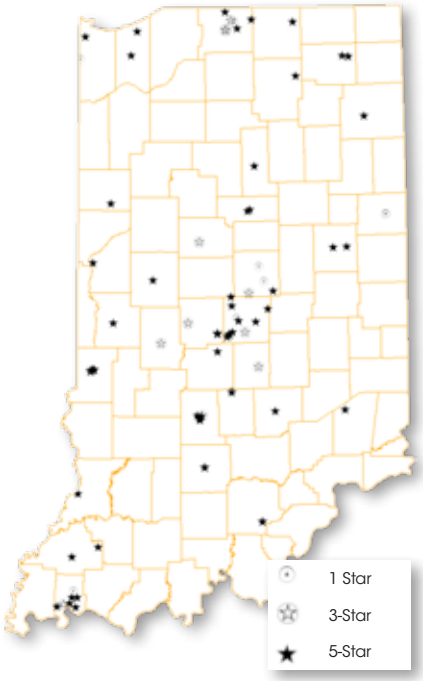
IDEM Five-Star Child Care Requirements

To achieve one star, the facility is required to:
- Complete a self-assessment
- Ensure the building is clean and well-maintained
- Provide hazard communication training for employees
- Flush cold-water pipes 30 seconds daily before first use
- Never store pesticides at the facility

To achieve three stars, the facility is required to:
- Meet all one star requirements
- Implement a 100 percent tobacco-free facility and grounds
- Perform a radon test
- Implement integrated pest management strategies
- Check for lead hazards in water, soil, dust, and paint chips
- Discourage idling vehicles near entrances/exits
- Contact utility company to identify PCB-containing transformers

To achieve five stars, the facility is required to:
- Meet all one and three star requirements
- Remove pets with fur or feathers
- Recycle
- Replace disposable utensils and plates with reusable dishware

Figure 6-2: Indiana Five Star Environmental Child Care Facilities (February 2012)



Source: Indiana Department of Environmental Management, Office of Pollution Prevention and Technical Assistance

What Families Need to Know

The American Academy of Pediatrics recommends that you ask these questions when evaluating a child care environment for your child:

- Is the setting smoke-free? Is there a smoke-free policy? Is smoking allowed when children are not present? Is smoking allowed in other parts of the building?
- Does the facility appear clean, in good repair, and without water-marked areas or areas of peeling and chipping paint?
- Is there evidence of water damage or mold? Have flooding or plumbing problems occurred? Are there musty odors?
- Are the rooms adequately ventilated?
- Has the child care center or home been tested for radon?
- Are fuel-burning furnaces, stoves, or other equipment in use?
- Are medications and chemical products properly labeled and stored in areas away from children and food? Are staff members trained in the safe use of chemical products and medications?
- Are arts and crafts supplies free of hazardous substances?
- Are the kitchen and bathroom areas meeting local health department regulations?
- Are hand-washing policies followed and monitored? Are soap and clean towels always available? Paper towels, rather than cloth towels, generally are preferred in child care settings. Individual cloth towels may be used for each child but must be changed frequently.
- Are indoor and outdoor storage closets and sheds locked children cannot get in? All maintenance, lawn care and other hazardous equipment, and chemical products (such as gasoline, paints, pesticides, and cleaning products) must be stored away from children.
- Is a carbon monoxide detector present and in working order?
- If the building was built before 1978, has it been assessed for lead paint, dust, and soil hazards? Homes and other buildings built before 1978 may contain lead, and those built before 1950 have the most lead. If remodeling or renovation work is under way, have lead and asbestos hazards been identified, and have children been protected from lead dust and asbestos particles?
- Is there standing water?
- Is integrated pest management used?
- Are there enough shady areas for play outside?[9]

Sources for More Information:

U.S. EPA Healthy Child Care:
http://www.epa.gov/childcare/

FSSA Bureau of Child Care:
http://www.in.gov/fssa/2552.htm

Indiana Association for Child Care Resource and Referral: http://www.iaccrr.org

Sources

[1] U.S. Department of Health and Human Services, Understanding Parents' Child Care Decision-Making: A Foundation for Child Care Policy Making, Research-to-Policy, Research-to-Practice Brief OPRE 2011-12 February 2011. Accessed at http://www.acf.hhs.gov/programs/opre/cc/childcare_technical/reports/parents_childcare.pdf

[2] American Academy of Pediatrics (AAP) Council on Environmental Health. Child Care Settings. In: Etzel, RA, ed. Pediatric Environmental Health, 3rd Edition Elk Grove Village, IL: American Academy of Pediatrics; 2012:115.

[3] AAP. Pediatric Environmental Health, p. 115

[4] AAP. Pediatric Environmental Health, pp. 116-7

[5] American Public Health Association, American Academy of Pediatrics. Caring for Our Children: National Health and Safety Performance Standards. Guidelines for Out-of-Home Child Care Programs. 2nd ed. Washington, DC: American Public Health Association; and Elk Grove Village, IL: American Academy of Pediatrics; 2002. Accessible at http://nrckids.org/CFOC3/index.html

[6] Registered ministries that take CCDF funding (and therefore meet provider eligibility standards) may not allow smoking. IC 12-17.2-3.5-12.1

[7] 470 IAC 3-4.5-4 for registered ministries and 470 IAC 3-4.8-1 for homes

[8] 470 IAC 3-4.5-4 for registered ministries and 470 IAC 3-4.8-1 for homes

[9] AAP. Pediatric Environmental Health, p. 121

Sunny Start
Healthy Bodies
Healthy Minds

Sunny Start
Healthy Bodies
Healthy Minds
2012
REPORT

Chapter 7

Key Findings

Young children age 0-5 are more susceptible to environmental threats because they are still growing and developing and their behaviors – crawling, playing in dirt, putting objects in their mouths – are different than adults. Studies have shown that young children can face life-long physical problems and learning disabilities if they are exposed to toxins during critical times of development. One child exposed to a toxic substance might end up with life-long disabilities, while another shows little or no harm. Environment, behavior, genetics and diet may all play a role in the development and prevention of disease.

The environments in which Indiana's young children live are important for policymakers to understand. Urban children can be exposed to more environmental toxins in their air, soil and poorly maintained housing. Rural children face risks from untreated drinking water, poor sewage treatment and exposure to agricultural chemicals. Paying attention to environmental conditions in communities can help ensure Indiana's children are healthy and ready to learn by age 5.

Environmental exposures may contribute to birth defects among Indiana infants, but more research is needed. Both genes and environment can influence birth defects, but much is still unknown.

Improving medical care and reducing prenatal alcohol, smoking and drug use can help reduce low birth weight babies. From 2000-2008, Indiana's rate of preterm births was higher than the U.S. rate. Also, Indiana's black infants are more likely than white infants to be born preterm or with low birth weights. Pregnant women can help reduce preterm births and low birth weights by avoiding alcohol, drugs, smoking and other environmental exposures and getting good medical care and support during their pregnancy.

Rates of lead poisoning have dropped dramatically since the 1970s, but children with lead poisoning are still found at higher rates in neighborhoods with older housing that is not well maintained. Indiana does not have universal screening for lead poisoning. Although all Medicaid-covered children are required to be screened at their 12-month and 24-month checkups, just 27.3 percent of Medicaid-eligible children in the 12-to-36-month age group had been screened in 2010.

Since 2007, the percent of children who have been diagnosed with asthma has risen and is now higher than national levels. Among all children age 0-17, asthma is the third leading cause of hospitalization in Indiana. Boys age 0-4 have the highest rates of asthma-related emergency department visits in the state.

While relatively few children get cancer, cancer causes more childhood deaths than any other disease. About 1 in 4,000 Hoosier children age 0-5 are diagnosed each year with some type of cancer. National studies are examining the possible links between environmental causes and childhood cancer.

Children spend an estimated 80 to 90 percent of their time indoors at home, school, or child care settings. Therefore, healthy indoor air is vital for a healthy child. Indoor air pollutants include tobacco smoke, gases from stoves, and gases and vapors from furnishings and construction materials. Home cleaning supplies, insect sprays, air fresheners and candles can also emit gases that affect a child's lungs.

While much progress has been made, an estimated 420,000 children in Indiana are still exposed to second-hand smoke at home. The adult smoking rate in Indiana is at an historic low of 21.2 percent, but it remains one of the highest adult smoking rates in the nation.

Indiana's outdoor air quality has improved and most of the state now meets most federal standards for outdoor air quality. However, there are still some days when Indiana's air is unhealthy, particularly for sensitive groups such as children and those with asthma or other breathing difficulties. Parents can monitor air quality by visiting airnow.gov, which provides air quality forecasts for anywhere in the United States.

About 1 million Hoosiers get their drinking water from private wells, which face greater risk of contamination by pathogens, nitrates, arsenic and pesticides. Most rural families rely on untreated groundwater from private wells for their drinking water. Private wells are also still found in cities, isolated suburbs and other communities that haven't fully extended drinking water service to their residents.

About 5.5 million Hoosiers receive drinking water from a community water system, and 99 percent of them drank water that met health standards in 2010. However, more than half of Indiana's 4,200 public water systems serve less than 100 people. According to IDEM, small systems often face challenges to provide safe drinking water, such as lack of funding and management capacity.

Concerns have been raised about atrazine because it is the most heavily used pesticide in Indiana, is the pesticide most frequently detected in waterways, and studies have linked it to health problems in infants. Several Indiana public water suppliers have been required to install new treatment systems to reduce atrazine levels. Small drinking water systems also have received assistance from IDEM to reduce atrazine levels during the peak spring season, when atrazine is applied to farm fields. The last time an Indiana public water system exceeded the federal atrazine standard was in 2005.

Young children eating fish from Indiana's lakes, reservoirs and ponds have a high risk of exposure to mercury and PCBs. Of the 231,000 acres of lakes, reservoirs and ponds monitored by the state, 84 percent are impaired because of high levels of mercury in fish and 81 percent have high PCBs in fish. To find out about the safety of fish in a waterway near you, go to www.fish4health.net.

Children swimming or wading in lakes and reservoirs, especially during summer months, face a risk of exposure to blue-green algae – also known as cyanobacteria. In 2011, high-risk health alerts for blue-green algae were issued for nine beaches at Indiana state parks and reservoirs. Children are more vulnerable to cyanobacteria because they can be exposed to a larger dose of toxin for their body weight.

Of the 28,790 river and stream miles assessed by IDEM as of 2012, 71 percent are considered "impaired" because they don't meet the state's fishable and swimmable goals or they don't adequately support aquatic life. E.coli bacteria are the most common reason a river or stream is impaired. High levels of E. coli can indicate that there is untreated human or animal waste in a waterway, and therefore disease-causing bacteria, viruses and other pathogens.

A growing number of large farm operations in Indiana are producing an increasing amount of animal manure each year, and that manure must be carefully managed to protect waterways and children's health. When not properly managed, manure can leak or spill from storage pits on these farms into local waterways. Improper application of manure to the land can contaminate local rivers and streams. New state rules go into effect in July 2012 to restrict manure application.

Untreated human sewage enters Indiana's rivers and streams on a regular basis – often because our sewage infrastructure is inadequate, poorly designed or poorly maintained. Sewer overflows also can be caused by blockages, broken pipes, sewer and manhole cracks, poor sewer system operation and maintenance, power failures, inadequate sewer design and vandalism. The untreated sewage from these overflows can contaminate waterways or back up into basements, causing property damage and threatening public health.

Sewage treatment is a serious problem in small rural communities, many of whom rely on either aging individual septic systems or pipes that send untreated sewage directly to waterways or drainage ditches. A 2011 survey of unsewered communities by the Indiana Rural Community Assistance Program revealed serious problems in 503 communities serving more than 47,000 homes and 1,200 businesses. Forty-six percent of these communities had failing septic systems or other failing on-site treatment systems. More investments need to be made to help these communities install, maintain and operate proper sewage treatment facilities.

Environmental threats in the home can include lead hazards, mold, secondhand smoke and other indoor air pollutants. A structurally sound, well-maintained home can lead to better health for the children living there. Indiana law sets basic requirements for construction of new housing but does not provide minimum health or safety requirements

for existing housing. While the State Health Commissioner and local health officers have general authority to order unhealthy conditions to be remediated or, in extreme cases, to order that housing be vacated, most local health departments do not have clear, specific and adequate authority to order that unhealthful or dangerous conditions in housing be fixed.

There is a lack of comprehensive data on the condition of housing in Indiana. The only widely available data is the American Housing Survey, and its data are only available for the nine-county Indianapolis Metropolitan Area. The data that are available show a need for improvement in Indiana's housing in the following areas: water leaks from the inside and outside; sewage disposal breakdown; siding problems; flush toilet breakdowns; and window and foundation problems.

Young children are naturally curious and like to explore their environment. At the same time, they lack judgment and coordination, making them prone to falls and accidents. Many of these injuries could be prevented. From 2003 to 2006, 227 infants died in Indiana due to unintentional and intentional injuries. For infants, more than two-thirds of all injury-related deaths were due to suffocation. Among young children age 1-4, the most common causes of injury-related death are motor vehicle accidents, drowning, fires and suffocation. The top three causes of hospital admissions for 1-4 year olds in 2003-06 were falls, fire and poisoning.

From birth through age 5, a child's brain is developing and building connections in response to the child's experiences and environment. The child care environment needs to be safe, healthy and filled with opportunities to learn and grow. Not all child care facilities in Indiana meet the basic health and safety standards recommended by the American Public Health Association and American Academy of Pediatrics (AAP). In Indiana, safety standards for child care facilities depend upon the type of facility, with licensed centers having to meet the most stringent requirements and registered ministries facing the fewest requirements for ensuring health and safety of children.

Indiana does recognize child care facilities that have taken extra steps to create a safe and healthy environment for Indiana children. The Indiana Department of Environmental Management's Five-Star Environmental Recognition Program for Child Care Facilities helps parents select an environmentally healthy child care; one that promotes healthy development in young children free from pesticides, harmful chemicals, lead paint hazards, radon, and other often invisible environmental health threats. As of February 2012, 86 child care facilities in Indiana had achieved recognition through IDEM's program.

Glossary

Acidification: the ongoing decrease in the pH and increase in acidity

Asthma: a disorder that causes the airways of the lungs to swell and narrow, leading to wheezing, shortness of breath, chest tightness, and coughing

Bronchitis: inflammation of the main air passages to the lungs

Chronic obstructive lung disease (COPD): refers to a group of lung diseases that block airflow as you exhale and make it increasingly difficult for you to breathe. Emphysema and chronic asthmatic bronchitis are the two main conditions that make up COPD.

Coliform: a broad class of bacteria found in our environment, including the feces of humans and other warm-blooded animals; the presence of coliform bacteria in drinking water may indicate a possible presence of harmful, disease-causing organisms

Dysentery: a general term for a group of disorders characterized by inflammation of the intestines

Endocrine system: the system of glands, each of which secretes a type of hormone directly into the bloodstream to regulate the body

Food chain: a series of organisms interrelated in their feeding habits, the smallest being fed upon by a larger one, which in turn feeds a still larger one, etc.

Gestation: the period of development in the uterus from conception until birth; pregnancy

Inorganic compounds: compounds that lack carbon and hydrogen atoms and are synthesized by the agency of geological systems

Lung disease: refers to many disorders affecting the lungs, such as asthma, chronic obstructive pulmonary disease, infections like influenza, pneumonia and tuberculosis, lung cancer, and many other breathing problems

Metabolism: the chemical reactions in the body's cells that convert the fuel from food into the energy needed to do everything from moving to thinking to growing

Neuroblastoma: a malignant (cancerous) tumor that develops from nerve tissue

Nontransient community water system: water provided to permanent, consistent buildings and the families or businesses that reside there

Nontransient noncommunity water system: water provided to a permanent population that changes day to day, such as campgrounds, hotels, rest areas, and restaurants with their own water supplies

Organic solvents: substances containing carbon and hydrogen atoms that dissolve other substances

Particle settling: the falling of suspended particles through a liquid

Peripheral nervous system (PNS): consists of the nerves and ganglia outside of the brain and spinal cord

Photosynthesis: a chemical process that converts carbon dioxide into organic compounds, especially sugars, using the energy from sunlight

Phthalates: a class of chemicals used as softeners, or plasticizers, in polyvinyl chloride (PVC, vinyl) products, including children's toys, decorating and building products, blood bags, and solvents and other additives in a wide range of consumer products, including cosmetics, personal care products, wood finishes and insecticides.

Pollutant: any substance as certain chemicals or waste products, that renders the air, soil, water, or other natural resource harmful or unsuitable for a specific purpose

Prenatal smoking: smoking existing or occurring before birth

Secondhand smoke: environmental tobacco smoke that is inhaled involuntarily or passively by someone who is not smoking

Volatile organic compounds (VOC): organic chemicals that have a high vapor pressure at ordinary, room-temperature conditions

Watershed: the area of land where all of the water that is under it or drains off of it goes into the same place; that area of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water course and where, as humans settled, simple logic demanded that they become part of a community

List of Acronyms

AAP – American Academy of Pediatrics
ADHD – Attention Deficit Hyperactivity Disorder
CCDF – Child Care and Development Fund
CDC – Center for Control and Prevention
CFO – Confined Feeding Operations
CSO – Combined Sewer Overflow
ED – Emergency Department
U.S. EPA – United States Environmental Protection Agency
FSSA – Family & Social Services Administration
IDEM – Indiana Department of Environmental Management
ISDH - Indiana State Department of Health
NACCRRA – National Association of Child Care Resource and Referral Agencies
NCHH – National Center for Healthy Housing
NOx – Nitric Oxide
O3 - Ozone
PCB – Polychlorinated Biphenyl
SIDS – Sudden Infant Death Syndrome
SO2 – Sulfur Dioxide
SSO - Sanitary Sewer Overflow
USGS – U.S. Geological Survey
VOC – Volatile Organic Compounds

This report is available on-line at sunnystart.in.gov/eh

The Sunny Start Vision:

In Indiana, children are safe, healthy and reach their full potential.

The Sunny Start: Healthy Bodies, Healthy Minds Initiative is a comprehensive, collaborative, statewide effort to support a coordinated system of resources and supports for young children from birth through age five and their families in Indiana. The goal of the project is to ensure that Indiana's children arrive at school healthy and ready to learn.

For More Information, go to sunnystart.in.gov

Sunny Start
Healthy Bodies
Healthy Minds