Recent years have witnessed an increase both in respect for the environment and in concern about the hazards posed to the environment by the growth of modern society. Children’s health has benefited from the heightened attention and expanded research and regulatory efforts directed toward identifying and ameliorating environmental hazards. For example, airborne levels of lead, a chemical which can cause illness and lower IQs in children, have dropped by 96% since 1975, thanks primarily to increased regulation. Yet, much more can be done to protect children from environmental health hazards, and there is reason to be concerned that pending legislation, designed to relax environmental safeguards enacted over the past decade, threatens progress in protecting children, and all age groups, from these hazards.

In this journal issue, the three articles following this introduction discuss the relationship between children’s health and the environment. The springboard for these articles was a national symposium, Preventing Child Exposures to Environmental Hazards: Research and Policy Issues, sponsored by the Children’s Environmental Health Network in March of 1994. This symposium brought together experts in research, policy, clinical practice, and advocacy to work toward establishing a national research and policy agenda for children’s environmental health. The full proceedings of the symposium are published in Environmental Health Perspectives, Supplement 4, 1995. The articles by Bearer and by Goldman originated in the symposium but have been substantially rewritten for publication in The Future of Children. The third article, by Landrigan and Carlson, was written especially for this journal issue and presents the policy context for actions to protect children from environmental hazards.
Although environmental hazards are of concern to all members of society regardless of age, several key issues are of particular importance to children’s health. First, despite the considerable activity over the past two decades to reduce environmental hazards, children continue to be exposed both to identified preventable environmental hazards and also presumably to many hazards which have yet to be identified. Second, children are at greater risk than adults for exposure to and illness from environmental hazards. The differences between the ways in which children and adults are affected by exposure to environmental hazards stem from differences in their physiology, behavior, and diet. Third, children may be inadequately protected from environmental hazards because no national research or policy agenda exists to address their unique vulnerabilities. The following three articles elaborate more fully on these key points and develop a number of recommendations for action to ameliorate the environmental hazards children face.

In the first article, Cynthia Bearer of Case Western Reserve University discusses the scientific basis for the differences between adults and children. She examines the physical and biological environments of developing children, and explores the consequences of those environments for children’s physical health. In the second article, Lynn Goldman of the U.S. Environmental Protection Agency describes several case studies of the consequences of children’s exposure to pesticides. These articles underscore the differences between adults and children, the observation that children are exposed to and frequently inadequately protected from environmental toxins, and the fact that increased awareness and vigilance will be necessary before it is even possible to quantify the scope of the problem.

In the final article, Philip Landrigan of the Mount Sinai Medical Center and Joy Carlson of the Children’s Environmental Health Network discuss the policy context for children’s health and the environment. Despite the known dangers to children’s growth and development, American society has still not expressed a commitment to ensure that children will grow up in a safe environment and reach their full potential unhindered by toxins in air and food. Landrigan and Carlson examine the ways in which environmental policies are formed, explore some of the successes and failures of past environmental policymaking as it relates to child health, and propose a new framework in which the health of children is explicitly considered as a part of environmental policymaking.
Despite the progress that has been made in the past two decades in developing environmental safeguards, and the arguments presented in this journal issue and elsewhere which support strengthening activities that prevent child exposure to environmental hazards, existing environmental policies are being reconsidered. As this journal went to press, the U.S. House of Representatives and the U.S. Senate had passed or were considering multiple bills that could suspend nearly all new environmental regulations in the United States. The Regulatory Transition Act of 1995 (H.R. 450) would place a one-year moratorium on new federal environmental and public health regulations. The companion Senate legislation (S. 219) would create a 45-day period for congressional review of new federal regulations. (These differences will be resolved in conference committee.) The House-passed Risk Assessment and Cost Benefit Act of 1995 (originally introduced as H.R. 1022 and finally repackaged as a portion of H.R. 9) imposes new risk assessment and cost-benefit analysis requirements on future attempts to promulgate regulatory safeguards. In addition, the Senate is currently considering comparable legislation, the Comprehensive Regulatory Reform Act (S. 343) and other bills which would require strict cost-benefit and risk assessment analyses for all federal environmental regulations.

Existing environmental statutes also may be changed. The House has passed amendments (H.R. 961) that severely weaken the Clean Water Act and is considering legislation to weaken the regulatory strength of the Safe Drinking Water Act and the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). In the opinion of some observers, these new requirements, if signed into law, would stifle efforts to protect the environment from toxins and, thus, have adverse effects on the health of children in this country.

Whether concern for children’s health plays an important role in the evaluation of environmental policy in this country is, at this point, an open question. Nonetheless, Landrigan and Carlson believe that “policymakers should consider the implications for human health and national productivity that may be associated with increased and unchecked exposure of America’s children to lead, air pollution, pesticides, and untested consumer chemicals of unknown toxicity. While short-term concerns about regulation of the business community certainly need to be heard, the immediate and longer-term effects of environmental degradation on the health of America’s children need to be weighed in the balance.”

Policymakers should consider the implications for human health and national productivity that may be associated with increased and unchecked exposure of America’s children to lead, air pollution, pesticides, and untested consumer chemicals of unknown toxicity.

The authors wish to thank Lawrie Mott of the Natural Resources Defense Council and Joseph Schwartz of Physicians for Social Responsibility for assistance in determining the status of environmental legislation pending at the time this issue went to press.
Environmental Health Hazards: How Children Are Different from Adults

Cynthia F. Bearer

Abstract

In policymaking on environmental health, it is often assumed that the entire population is exposed to and reacts to environmental contaminants in a similar manner. However, this assumption is misguided, especially where children are concerned. This article presents the scientific basis for the impacts of the environment on children, showing how children are different from adults in the ways in which they are exposed to environmental contamination and the ways in which they react to it when exposed. Specifically, the article examines the changing physical and biological environments of children. Children at different stages of development have unique physical risk factors for certain types of exposure because of changing location, levels of mobility, oxygen consumption, eating patterns, and behavior. When children are exposed to contaminants, their developing biological makeup—the way in which they absorb, distribute, and metabolize chemicals—will also affect how their bodies deal with the foreign substance. Each of these factors, along with the customs, laws, and regulations that affect the way in which children are exposed to the contaminants, has implications for the well-being of children in the years to come.

As the human population increases, its demands on the earth also increase. Today, the demand for food, potable water, clean air, energy, and manufactured goods; the need for solid and liquid waste disposal; and the requirement for habitable land are all expanding. With this expansion, increasing amounts of pollutants are released into the environment, and more and more people come into contact with polluted environments.

Interaction with polluted environments can have an adverse impact on the health of humans and other living creatures. This impact is felt first among the most vulnerable members of a population. Children, because of their unique physical, biological, and social characteristics, are among the most vulnerable members of our population.

We have become increasingly aware of the dangers posed by the accumulation of pollutants in the environment and have looked to policy...
in the form of legislation, regulation, and private, voluntary action for protection. It may, however, be costly to identify and effectively deal with environmental hazards, particularly when there are benefits to be gained from the use of hazardous materials. Under these circumstances, effective policymaking depends on honest and accurate assessment of the risks posed to all members of society, including children. For a variety of reasons, special consideration should be given to protecting children in formulating environmental policies: children are less able than adults to protect themselves, may be more vulnerable to particular toxins, and are not considered responsible for pollution. Crafting environmental policies responsive to the special needs of children requires a thorough consideration of these special needs and an understanding of how these needs may change as children grow and develop.

This article presents the scientific basis for the impacts of the environment on children. It describes the differences between adults and children in physical, biological, and social environments, and highlights why children should not be treated as “little adults” in developing environmental policy.

**Human Environments**

Children exist within three broad types of environments: physical, biological, and social (see Figure 1). Each affects their well-being, is at risk of degradation, and is amenable to policy intervention. The physical environment is anything that comes in contact with the body. Air, for example, is in constant contact with our lungs and skin, and is a large part of our physical environment. To define the physical environment precisely, it may be necessary to divide a large environment into smaller units, called microenvironments. For example, in a room contaminated with radon, the radon will not be evenly dispersed; air near the floor has a higher radon concentration while air near the ceiling has a lower radon concentration. Therefore, the environment of an infant playing on the floor would be much different from that of an adult standing in the room. These microenvironments can differ enormously between adults and children in many situations.

The biological environment consists of the internal physiological workings of the body as it takes up, processes, and interacts with the substances it contacts. The body has specific chemical pathways used to digest, process, and excrete substances found in air, food, and water. The multiple steps by which a toxic hazard may result in adverse health effects help illustrate the complexity of the biological environment. The steps are (1) absorption (how the chemical gets into the body), (2) distribution (once inside the body, how the chemical gets to each of the organs and in what amount), (3) metabolism (how the body processes the chemical), and (4) the toxic action (how the chemical interacts with the biochemistry of the body). Each of these steps depends on the developmental stage of the child because the child’s biological environment changes over time.

The social environment includes the day-to-day circumstances of living in a family or other setting as well as the laws and regulations that affect day-to-day living. Children, because of their continued development and their different physical and biological environments, are a unique group of individuals in relation to toxic hazards. If laws, regulations, policies, and behavior do not reflect this fact, then chil-
Children may be unwittingly exposed to environmental hazards. In time, children may become bodies of evidence that environmental degradation can have severe impacts on the health of societies.

This article concentrates largely on the physical and biological environments of children at various developmental stages. The social environment is discussed in detail in the article by Landrigan and Carlson in this journal issue.

**Developmental Stages**

A child’s vulnerability to environmental exposures is closely related to his or her developmental stage. Changes in growth, hormonal levels, and biochemical makeup continually occur. Developmental stages are periods in a child’s life characterized by the achievement of certain intellectual and physical milestones. For organizational purposes, this article recognizes five stages: the newborn (from birth to 2 months of age), the infant/toddler (2 months to 2 years of age), the preschool child (2 to 6 years of age), the school-age child (6 to 12 years), and the adolescent (12 to 18 years). The fetus is considered as a single separate stage, although there are multiple critical stages of development for the fetus.

**The Physical Environment**

Exposure to an environmental agent is the first step in a sequence of environmentally related health effects. Exposure may occur at any point as people move through several environments during the course of a day. Adult environments include home, work, and errands outside home and work. Infants and children spend time at home, school, day care, and play. Because the environments of children are typically different from those of adults and may vary according to the age of the child, children’s exposure to environmental agents may be different from exposures of adults and may vary with the developmental stage of the child. In addition, different patterns of exposure to a toxin may yield different
health effects. For example, nitrates in well water may cause the hemoglobin in blood to become methemoglobin. If too many nitrates are ingested, this chemical change can cause insufficient oxygen to reach the body tissues. However, if the nitrates are ingested at a rate that is slow enough for the enzymes in the blood to convert the methemoglobin back to hemoglobin, no health effect will occur.

Exposure Before Birth

Exposures that have profound health effects on an individual may occur before birth. Even exposures that occur to women before the conception of a child may have an effect on that child (see Table 1). For example, women who conceived after eating cooking oil contaminated with polychlorinated biphenyls (PCBs) gave birth to infants with a pattern of abnormal physical characteristics called yusho. In another case, a woman inadequately treated for lead poisoning in childhood gave birth to an infant with congenital lead poisoning.

An individual can also be affected by exposures that had direct effects on the ovum and sperm prior to conception. The ovum, formed within the fetus of the future mother, is affected by the exposures both of the grandmother and the future mother. Studies have measured chemicals foreign to the human body in the fluid that bathes the ova prior to ovulation, showing the potential for exposure. Sperm, in contrast, are created only a few hours to a few days prior to conception. Thus, harmful effects to the sperm are most likely the result of the father's exposure in the period immediately before conception.

In most instances, exposures after conception are dependent on exposures to the mother. Infants may experience the result of exposure to many of the toxins mothers come into contact with during the pregnancy. For example, maternal smoking during pregnancy is associated with reductions in forced expiratory flow rates for the child.

Exposure from Birth to Adolescence

Exposures for newborns, infants and toddlers, preschool children, school-aged children, and adolescents depend on their physical location, breathing zones, oxygen consumption, food consumption, types of foods consumed, and normal behavioral development (see Table 2)—all of which change as the child develops.

Physical Location

That the physical location of children changes with development has large implications for a child's exposure. Premature and sick newborn infants are exposed to noise, light, compressed gases, intravenous solutions, and benzyl alcohol, among other things, during their stay in neonatal intensive care. Most newborns, however, are usually near their mothers, so exposures will be similar to those experienced by the mothers. Moreover, a newborn frequently spends prolonged periods of time in a single environment, such as a crib. Infants and toddlers, on the other hand, are frequently placed on the floor, carpet,

<table>
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<th>Table 1</th>
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<td><strong>Periconceptual Exposures of Possible Importance</strong></td>
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<tr>
<td><strong>Grandmother</strong></td>
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<td><strong>Father</strong></td>
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<td><strong>Mother</strong></td>
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or grass. They therefore have more exposure to chemicals associated with these surfaces, such as formaldehyde and volatile organic chemicals from synthetic carpets and pesticide residues from flea bombs.

Children who are not yet able to walk or crawl may also experience sustained exposure to noxious agents because they cannot remove themselves from hazardous environments. The infant who is badly sunburned because of his or her inability to escape from the sun is a good example.

Many preschool children spend part of their day in a day-care facility, which can be located anywhere from church buildings to private homes. In addition, preschool children may spend a significant period of time in outdoor environments such as playgrounds and backyards.

School-aged children spend a significant period of time at school, a very different physical environment from a house or an apartment. Schools are sometimes built on relatively undesirable land. School sites may be near highways (resulting in exposure to auto emissions and lead), under power lines (resulting in exposure to electromagnetic fields), or on old industrial sites (resulting in exposure to benzene and arsenic).

Adolescents may not only have a new school environment, but also select for themselves other physical environments in which they misjudge or ignore the risks. Attendance at concerts with damaging sound levels is a relatively benign example of a situation in which adolescents willingly put themselves at risk. Many adolescents also have part-time jobs that place them in physical environments which may be hazardous because of occupational exposures.

**Breathing Zones**

Breathing zones, the places in space where individuals breathe, are also closely related to development. The breathing zone for an adult is typically four to six feet above the floor. However, for a child, it will be closer to the floor. It is within these lower breathing zones that heavier chemicals such as mercury and large breathable particulates settle out and radon accumulates. The presence of mercury in a child’s breathing zone which came from latex house paint accounted for a Michigan child’s case of acrodynia, a form of toxicity from mercury exposure. (See the article by Goldman in this journal issue.)

**Oxygen Consumption**

Because children are physically smaller than adults, their metabolic rate is higher than that of adults and they consume more oxygen relative to their size than do adults. As a result, a child’s exposure to an air pollutant may be greater than an adult’s. For example, if radon is present, a six-month-old child with an average oxygen consumption rate will, over a given period of time, receive twice the exposure to radon as will an adult with an average oxygen consumption rate.

**Quantity and Quality of Food Consumed**

Similar to their need for proportionately more oxygen than adults, children’s higher metabolic rates mean that they need to consume more calories per pound of body weight than adults. Quite simply, the amount of food that children consume per pound of body weight is higher than that of adults. The reason for this difference is that children not only maintain homeostasis, as adults do, but also grow.

Consider the amount of water that an infant who receives formula reconstituted in boiled tap water drinks every day. The average infant consumes six ounces of formula per kilogram of body weight. For the average male adult, this is equivalent to drinking 35 cans of soda pop a day.
### Environmental Risk Factors for Children at Different Stages of Development

<table>
<thead>
<tr>
<th>Developmental Stage</th>
<th>Developmental Characteristics</th>
<th>Exposure Pathways (Physical Environment)</th>
<th>Biological Vulnerabilities</th>
<th>Appropriate Responses in the Social Environment</th>
</tr>
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<tbody>
<tr>
<td><strong>Newborn</strong> (0 to 2 months)</td>
<td>Nonambulatory, Restricted environment, High calorie/water intake, High air intake, Highly permeable skin, Alkaline gastric secretions (Low gastric acidity)</td>
<td>Food, Breast milk, Infant formula, Indoor air, Tap/well water in home</td>
<td>Brain, Cell migration, Neuron myelination, Creation of neuron synapses, Lungs, Developing alveoli, Bones, Rapid growth and hardening</td>
<td>Need for newborn-sensitive programs and regulations regarding; Polychlorinated biphenyls (PCBs), Lead in drinking water, Environmental tobacco smoke, Need to educate parents and policymakers concerning environmental hazards</td>
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<tr>
<td><strong>Infant/Toddler</strong> (2 months to 2 years)</td>
<td>Beginning to walk, Oral exploration, Restricted environment, Increased time away from parents, Minimal variation in diet</td>
<td>Food, Baby food, Milk and milk products, Air, Indoor, Layering effects, Tap/well water in home and day care, Surfaces, Rugs, Floors, Lawns</td>
<td>Brain, Creation of synapses, Lungs, Developing alveoli</td>
<td>Need for child-sensitive programs and regulations regarding; Radon in the home, Residential pesticide use, Lead abatement, Environmental tobacco smoke, Need to educate parents and policymakers concerning environmental hazards</td>
</tr>
<tr>
<td>Developmental Stage</td>
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<tr>
<td>Preschool Child (2 to 6 years)</td>
<td>Language acquisition Group and individual play Growing independence Increased intake of fruits and vegetables</td>
<td>Food Fruits, vegetables Milk and milk products Air Day care/preschool Outdoor Water Tap/well Water fountains</td>
<td>Brain Dendritic trimming Lungs Developing alveoli Increasing lung volume</td>
<td>Need for child-sensitive programs and regulations regarding: Food pesticides Environmental tobacco smoke at home and at preschool Need to educate parents and policymakers concerning environmental hazards</td>
</tr>
<tr>
<td>School-Aged Child (6 to 12 years)</td>
<td>Beginning of school Playground activities Increased involvement in group activities</td>
<td>Food At home and school Air School air Outdoor air Water School water fountains Tap/well Other Arts and crafts supplies</td>
<td>Brain Specific synapse formation Dendritic trimming Lung Volume expansion</td>
<td>Need for child-sensitive programs and regulations regarding: Asbestos abatement Lead in school drinking water Hazards in arts and crafts materials Need to educate parents and policymakers concerning environmental hazards</td>
</tr>
<tr>
<td>Adolescent (12 to 18 years)</td>
<td>Development of abstract thinking Puberty Growth spurt</td>
<td>Food Air Water Other Occupation Self-determination</td>
<td>Brain Continued synapse formation Lung Volume expansion Gonad maturation Ova and sperm maturation Breast development</td>
<td>Need for adolescent-sensitive programs and regulations on child labor and other issues Need to educate parents and policymakers concerning environmental hazards</td>
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*Layering effects occur when a particle in the air is distributed in layers in a room. Radon, for example, is more concentrated closer to the floor, where infants and toddlers are likely to be.*
been found in infants with heavy exposure to tap water from reconstituted formula. Adults consuming the same tap water would suffer no adverse health effects because they would ingest much less lead relative to their body weight.

In addition, the types of food children consume differ from those consumed by adults. The diet of many newborns is limited to breast milk, which may contain environmental pollutants including lead, PCBs, and dioxins. The diet of children also contains more milk products, fruits, and vegetables than the typical adult diet, and as a result, children may be exposed to more dangerous levels of pesticides and other chemical residues than adults.

Normal Behavioral Development

The normal behavioral development of a child will also influence environmental exposures. Infants and young children may not be able to remove themselves from noxious environments. Normal children pass through a developmental stage of intense oral exploratory behavior from about age six months to two years, when most objects grasped will be placed in the mouth. This behavior is one common cause of lead poisoning in environments with high levels of lead dust, such as houses painted with lead-based paint. It also places the child at risk in environments that have not taken the oral orientation of young children into account. For example, some wood used in playground equipment is treated with arsenic and creosote. In the course of normal play, children will frequently place their mouths on playground equipment, inadvertently exposing themselves to these toxic chemicals.

The ability to walk often places children in play situations that have the potential for dangerous exposures, such as near empty lots, mud puddles, and used containers holding oil or other liquid substances. As children become adolescents, they gain more and more freedom from the parental supervision that might otherwise protect them from some exposures. Their physical strength and stamina are well developed, but they are still acquiring abstract thinking. They do not consider cause and effect, particularly delayed effects, in the same way that adults do. Because of this lack of perception, they often place themselves in situations with greater risk than an adult would willingly face. An example is the higher incidence of farm injuries among adolescents than among adults.

The Biological Environment

The biological environment—the internal physiological workings of the body as it takes up, processes, and interacts with the chemicals it contacts—is another important part of a child’s overall environment. The body has specific chemical pathways used to digest, process, and excrete substances found in air, food, and water, which vary at different stages of development. A chemical that comes into contact with the biological systems of a child’s body can produce adverse health effects or be processed into nonharmful substances.

Absorption

Absorption is the way a chemical enters the body. Absorption generally occurs in one of four ways: through the placenta, the skin, the respiratory tract, or the digestive tract. Each of these portals of entry is dependent on the developmental stage of the child.

Through the Placenta

During the fetal stage, the placenta is a major pathway of absorption. Several classes of compounds readily cross the placenta, including compounds with low molecular weight, those that are fat-soluble, and other specific compounds such as calcium and lead. Carbon monoxide, a poisonous compound of low molecular weight, crosses the placenta readily. When carbon monoxide enters the blood, it binds to hemoglobin, creating carboxyhemoglobin. This bond prevents hemoglobin from binding to oxygen and delivering
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it to the cells. Because carbon monoxide has a higher affinity for fetal hemoglobin than it does for adult hemoglobin, the concentration of carboxyhemoglobin is higher in the fetus than in the mother. Therefore, the infant may have reduced oxygen delivered to tissues, with subsequent organ damage.

Fat-soluble, or lipophilic, compounds, such as polycyclic aromatic hydrocarbons (found in cigarette smoke) and ethanol (found in alcoholic beverages), readily gain access to the fetal circulation and thereby may cause toxic effects in the fetus. Also, mechanisms in the placenta actively transport specific nutrients and toxins to the fetus. Lead, for example, is found in equal concentrations in the mother and the fetus.

Through the Skin

The skin undergoes enormous changes with development which affect its absorptive properties. Pathways of absorption through the skin are particularly important for fat-soluble compounds. Because the skin is mainly composed of fatty chemicals, fat-soluble chemicals generally cross it more readily than other chemicals.

The outside skin layer of a fetus lacks the rough exterior dead skin layer called keratin and thus is without one of the major barriers of the skin. The acquisition of keratin occurs over the initial three to five days following birth. Therefore, the skin of a newborn is a particularly absorptive surface, and absorption of chemicals through the skin has caused many cases of illness in newborns. For example, hypothyroidism has resulted from iodine in betadine scrub solutions used for sterilization of the skin prior to birth or other skin penetrating procedures, such as obtaining blood or starting intravenous fluids. Neurotoxicity has occurred from hexachlorophene solutions which were used to bathe infants following birth, and hyperbilirubinemia has resulted from a phenolic disinfectant used to clean equipment between use for different patients.

An additional factor in the absorption of these chemicals through the skin is the larger surface-to-volume ratio of newborns compared with older children and adults. This means that for the same amount of skin covered with a chemical, the younger child may receive up to three times the dose received by an adult.

Through the Respiratory Tract

During prenatal life, the fetus makes breathing motions. Although the net flow of fluid is from the lungs out of the tra-
chea into the amniotic fluid, some chemicals in amniotic fluid may come in contact with the lining of the respiratory tract. Studies on this pathway of exposure to foreign chemicals are limited.

The surface absorptive properties of the lung do not change during development; the lungs continuously absorb airborne chemicals in the same manner. However, from birth to adolescence, the lung continues to develop more alveoli, the terminal air sacs through which humans breathe. The increase in the number of alveoli increases the size of the absorptive area in the lungs. Thus, some airborne chemicals may gain greater access to the body through the lungs as the child ages.

Through the Gastrointestinal Tract
The gastrointestinal (digestive) tract, at all stages of development, provides many opportunities for exposure to environmental toxins. The fetus actively swallows amniotic fluid. Chemicals, including certain pesticides as well as chemicals from tobacco smoke, can be present in amniotic fluid, but it is not known if the fetus absorbs those chemicals by swallowing the fluid. Following birth, stomach acid secretion is relatively low, but it will achieve adult levels by several months of age. As the infant grows, the difference in acidity will markedly affect absorption of chemicals from the stomach.

The small intestine in the newborn can respond to increased nutritional needs by increasing absorption of a particularly needed nutrient. For example, because children’s bones are still growing, they require more calcium than adults. Thus, children absorb more calcium than adults do from the same food sources. However, this enhanced absorption can create problems. Lead, because it is absorbed in place of calcium when it is present, is absorbed to a greater extent in children than in adults. An adult will absorb 10% of ingested lead, whereas a one- to two-year-old child will absorb 50% of ingested lead.

Distribution
The distribution of chemicals, the process by which chemicals get to body organs, varies with the developmental stage of the child. For example, many drugs become more diluted in newborns than they do in adults, spreading out so that more of the body has contact with them at lower levels. In animal models, it has been shown that lead is retained to a larger degree in the infant animal brain than in the adult. Lead also accumulates more rapidly in children’s bones than in adult bones, doubling between infancy and the late teen years.

Metabolism
Metabolism is the way the body processes chemicals using a series of steps, or pathways, to alter chemicals for use as fuel or for waste. It may result in activation or deactivation of the chemical by the body. The metabolism of chemicals depends on the child’s developmental stage, and the end result may either protect or harm the child, depending on the chemical in question.

The activity in each step of a metabolic pathway is determined by developmental stage and the genetic background of each individual. Therefore, some people are more susceptible to adverse effects from certain exposures. There are also large differences in the ways enzymes work in metabolic pathways between developmental stages. The same enzyme may work more or less depending on the age of the individual.

In some instances, the lack of certain pathways can be a protective factor. In the adult, high levels of acetaminophen may cause fatal liver poisoning, because adult metabolism breaks down the drug into subcomponents that are harmful to the liver. However, infants are not as easily hurt by acetaminophen. Infants born to mothers with high acetaminophen levels will also have high acetaminophen levels in the blood, but they will not have liver damage.
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The reason for this lack of damage is that the metabolic pathways of the fetus have not yet developed enough to break down the drug into harmful subparts.49

**Target Organ Susceptibility**

Children are also different from adults because their organs are undergoing growth and maturation, a process that may be adversely affected by exposure to harmful chemicals. Responses of children’s bodies to harmful exposures may differ from responses of adults’ bodies to these exposures in both the nature and the severity of the effect. Examples of such outcomes are poor fetal growth, poor growth in childhood, diminished intelligence quotient (IQ), precocious puberty, small head size, and diminished lung capacity.

The body experiences three types of growth: multiplicative, where cells divide; auxelic, where existing cells become larger; and accretionary, where ground substance and nonliving structural components accumulate.50 Multiplicative growth is complete around six months after conception for tissues that do not undergo continual turnover throughout life, such as skin cells. After that point, all growth is accretionary or auxelic.

Cells undergo two further processes to become the adult organism: differentiation and migration. Differentiation occurs when cells take on their individual tasks within the body and lose the ability to divide. The trigger for differentiation may be hormones, so when chemicals mimic hormones they can alter the differentiation of some tissues. Because the organ systems in children, including the reproductive system, are continuing to differentiate, a chemical that mimics a hormone can have drastic effects on the development of those organ systems. Chlorinated insecticides are an example of this mechanism. Studies have shown effects on the adult rat reproductive system from neonatal exposure to chlordecone,51 including abnormal growth of the vagina and sterility.52

Cell migration is necessary for certain cells to reach their destination for function. Neurons, for example, originate in a structure near the center of the brain, then migrate out to a predestined location in one of the many layers of the brain.55 Chemicals such as the ethanol in alcoholic beverages may have a profound effect on this process, as shown in children with fetal alcohol syndrome. Prenatal exposure to ethanol may result in interruption in this process severe enough to cause obvious malformations of the brain.54,55

Some organs continue to develop for several years. The brain and the lungs both have prolonged periods of postnatal development which are not complete until adolescence.39,56 This protracted period of growth and development increases the vulnerability of these organs. For example, brain tumors are frequently treated by radiation therapy in adults, with uncomfortable but reversible side effects. However, in infants, radiation therapy needs to be minimized when possible because of profound and permanent effects on the developing central nervous system.57

Another example of the unique vulnerability of children is the toxic effects of lead on the brain and nervous system. The current blood lead concentration of concern for children is 10 mcg/dl,58 based on studies59 which found that children with blood lead concentrations above that level may have measurable decreases in intelligence quotient. Because of differences in developmental stage, the occupational limit for exposure to lead for adults is six times higher than the limit for children.60

**The Social Environment**

For every developmental stage, there are unique combinations of developmental characteristics, physical environment, and biological environment that place children at special risk of harm. To protect children from the harms caused by exposure to
environmental toxins, it is necessary also to consider the customs, laws, and regulations that help define children’s environments.

In many ways, regulatory policies have not taken the characteristics of children into account. For example, for infants who are formula-fed, the amount of water consumed is enormous, and yet our water safety policies do not always take the increased consumption and special vulnerabilities of newborns into account when they are determined. Standards for radon testing and reentry times listed on the label of home pesticides should allow adequate protection for infants who spend so much of their time on the floor, but such considerations may not be reflected in recommended practice. Similarly, pesticide regulations should be made with the special diet of children in mind. Adequate laws to prevent exposure to environmental tobacco smoke for children attending daycare facilities could prevent the exposure of many children to environmental tobacco smoke.61

For the school-aged child, regulation of the school environment is of particular concern. The drinking water at the tap in schools should be judged safe for a child’s consumption. Arts and crafts supplies should be designed and purchased keeping in mind a child’s unique way of handling these materials. For adolescents who are beginning to work, child labor laws should be adequate not only to protect them from occupational risks, but also to ensure that their ability to learn in school is not adversely affected.

These are only a few examples of the potential effects of laws and regulations on the environments of children. These social environment effects are discussed more thoroughly in the article by Landrigan and Carlson in this journal issue.

**Conclusion**

There are many reasons children cannot be considered little adults in the area of environmental health. Important differences exist between children and adults in exposures, absorption pathways, tissue distribution, ability to transform and eliminate chemicals, and body response to environmental chemicals and radiation. Each of these differences is dependent on the developmental stage of the child, and all children are not the same during each stage (see Table 2). When considering the health impacts of a particular exposure on the population and potential policies to alleviate those impacts, each of these differences must be heeded.

What can be done to alleviate the harm—both potential and actual—done to children by environmental pollution? Health care providers, policymakers, teachers, community leaders, parents, and children all have roles to play in preventing children’s exposure to harmful agents in their environment and in addressing the consequences for children who are exposed.

Education about the unique vulnerability of children to environmental pollution is one powerful tool for change. Teaching parents and children how to avoid harmful exposures and therefore prevent environmental illnesses is an important piece of prevention, which can occur at many levels and in different settings. However, education can and should go beyond parents and children. Clinicians can be especially helpful when serving as educators, investigators, and advocates for children. Most environmentally caused diseases have been diagnosed by alert, environmentally aware clinicians, and publication of case studies has allowed further education of other clinicians about environmentally mediated diseases. Increased awareness of the effects of environmental hazards on children can influence both exposure and treatment for children.

Community leaders and policymakers can use information presented by parents, clinicians, scientists, and other advo-
cates for children and the environment to take the unique vulnerability of children into account when establishing regulatory policy. To bring about change, policymakers must understand the basis for this unique vulnerability—that children are not little adults.

1. The fetus represents a unique period of time in life when many critical chemical reactions are occurring, the disruption of which can have far-reaching consequences. In addition, the environment of the fetus is unique.


3. This is an example of a threshold effect, where the health effects will not occur until the toxin reaches a particular level in the body.


5. The reason for the linkage of PCBs with birth defects is not completely clear. The most likely explanation is that, when the women were exposed to high levels of the PCBs, their bodies stored them in their fat tissues, where they slowly were released into the bloodstream. When these women became pregnant, the PCBs in the bloodstream crossed the placenta and affected the fetus. Taylor, P.R., Lawrence, C.E., Hwang, H.L., and Paulson, A.S. Polychlorinated biphenyls: Influence on birthweight and gestation. *American Journal of Public Health* (1984) 74:1153–54; Yu, M-L., Chen-Chin, H., Gladen, B.C., and Rogan, W.J. In utero PCB/PCDF exposure: Relation of developmental delay to dysmorphology and dose. *Neurotoxicology and Teratology* (1991) 13:195–202.


7. Storage in the woman’s bones of lead that became mobilized during pregnancy is the most logical explanation for this result, although definitive proof is awaiting further technological advances. Silbergeld, E.K. Lead in bone: Implications for toxicology during pregnancy and lactation. *Environmental Health Perspectives* (1991) 91:63–70.


13. In addition, because the risk of skin cancer is most closely related to the amount of sun damage the skin sustains during the first 18 years of life, an infant’s caregiver determines part of an infant’s personal risk for this disease later in life. Jackson, R.J. Testimony to the U.S. House of Representatives, Select Committee on Children, Youth and Families, 1990.

14. The evidence that exposure to electromagnetic fields is hazardous to children is inconclusive. Several studies have found an association between children’s cancer and exposure to electromagnetic fields, but a causal relationship between exposure and disease has not been established. For further information, see Savitz D. Overview of epidemiologic research on electric and magnetic fields and cancer. *American Industrial Hygiene Association Journal* (April 1993) 54:4:197-204; Hendee, W.R., and Boteler, J.C. The question of health effects from exposure to electromagnetic fields. *Health Physics* (February 1994) 66:2:127–36.


35. Although chemicals have been described in amniotic fluid, the absorption of these compounds through the skin has not been studied. Van Yunakis, H., Longone, J.J., and Milunsky, A. Nicotine and cotinine in the amniotic fluid of smokers in the second trimester of pregnancy. *American Journal of Obstetrics and Gynecology* (1974) 120:64–66.


48. For example, theophylline, a drug commonly prescribed for all age groups by physicians, is metabolized by several different chemical pathways. During the newborn period, these pathways operate at low levels, so theophylline remains in the body unchanged for a long period of time. However, the pathways become increasingly present over the next several months, breaking theophylline down so it is not in the body as long in the same chemical form. To keep the same level in the body, the prescribing physician has to increase the prescribed dose. In adolescence, the metabolic breakdown of theophylline slows again, possibly because steroid hormones are competing for the same pathways. (Levi, P.E. Toxic action. In *A textbook of modern toxicology*, E. Hodgson and P.E. Levi, eds. New York: Elsevier, 1987, p. 152.) To accommodate this change, the dose of the drug must be reduced to avoid overdosing the patient.


52. Tissues undergoing multiplicative growth (by cells dividing) and the final stages of growth and change (differentiation) are particularly susceptible to cancer. (Levi, P.E. Toxic action. In *A textbook of modern toxicology*, E. Hodgson and P.E. Levi, eds. New York: Elsevier, 1987, p. 152.) This increased susceptibility is due to the shortened time period for DNA repair and the multiple changes that are occurring within the DNA as the cell grows. The epidemic of scrotal cancer among the chimney sweeps of Victorian England shows how exposure to chemicals can interfere with these stages of development. (Nethercott, J.R. Occupational skin disorders. In *Occupational medicine*, J. LaDou, ed. San Mateo, CA: Appleton & Lange, 1990, p. 218.) Chimney sweeps were usually adolescent boys with developing secondary sexual characteristics who would climb naked inside chimneys to clean them, exposing their entire bodies to soot. Occupational exposure to cancer-causing chemicals such as soot was common for many occupations at the time, but scrotal tumors were uncommon in groups other than young male chimney sweeps. Thus, it is likely that the scrotum at this stage of development had increased susceptibility to the chemicals in soot.


55. In the brain, two other processes deserve mention: the making of synapses (synaptogenesis) and dendritic trimming. Nerve cells communicate through cellular structures called synapses, which are the basis for the circuitry of the brain. Up to two years of age, the brain makes synapses rapidly. After age two, while specific synapses are formed as learning occurs, formation is much slower. In fact, after age two, the brain begins actively to remove synapses, so that a two-year-old’s brain contains more synapses than it will at any other age. This process, called dendritic trimming, occurs so that the resulting network of neurons will be more specific.


60. At that level, adults do not have brain problems but may have impaired kidney function, decreased fertility, and problems with the peripheral nerves. Royce, S.E., ed. Case studies in environmental medicine: Lead toxicity. U.S. Department of Health and Human Services, Agency for Substances and Disease Registry, Washington, DC, 1990, p. 5.

Case Studies of Environmental Risks to Children

Lynn R. Goldman

Abstract

Doing a better job of protecting children from environmental hazards requires having more and better information about both children’s susceptibility and their exposure to toxic substances. There are many critical gaps in knowledge of this issue. This article presents several examples specifically related to children’s exposure to pesticides which illustrate environmental risks for children. The cases examined include the risk posed to children by the use of the insecticide aldicarb on bananas, and reported illnesses in children caused by the use of the insecticide diazinon in the home and by the use of interior house paint containing mercury. The cases presented illustrate how regulatory agencies, parents, health care providers, and others who come into contact with children on a regular basis all have roles to play in filling in the information gaps regarding children’s exposure to environmental hazards and the deleterious effects of these exposures.

As discussed by Bearer in this journal issue, children are more susceptible to the deleterious effects of many environmental exposures than adults. Much current knowledge about the effects of environmental hazards on children comes from experience. We have learned from major environmental disasters, such as the Love Canal experience, which showed what can go wrong when an elementary school is built directly over a hazardous waste disposal site, and from other cases of exposures to chemicals whose effects are not obvious for decades, such as vaginal cancer following exposure in utero to diethylstilbestrol (DES).1 Each discovery of a new deleterious effect adds to the urgency of understanding and responding to the consequences for children of environmental hazards. Environmental legislation of the 1970s and 1980s, which responded to public concern about evidence of a pattern of environmental destruction in America, created a network of laws and regulations to protect the environment. These statutes—including the Clean Air and Water acts, Toxic Substances Control Act, Resource Conservation and Recovery Act, Safe Drinking Water Act, and Comprehensive Environmental Response, Compensation, and Liability Act

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(Superfund law), along with state laws and programs—have helped to benefit public health and protect the environment. But more can be done, particularly to safeguard children from environmental risks. Recognizing that children are not simply “little adults” is key to making environmental policy more responsive to children’s needs.

Doing a better job of assessing risks for children requires more information about both their susceptibility and their exposure to toxic substances. Too many critical gaps in existing data persist. Although developing the needed information is a complex matter, scientists in government, academia, and elsewhere have succeeded in filling some of the gaps, and research currently under way needs continued support. At the same time, however, incorporating existing information into the assessment of children’s risks must become a priority.

Although children typically face environmental risks from a variety of sources, this article presents a series of examples specifically related to pesticides to illustrate environmental risk issues involving children. These cases, drawn from government reporting systems and clinical observation of children, highlight the importance of taking the special status of children into consideration when developing environmental policy.

**Government Reporting Systems**

One mechanism that can identify the potential effects of environmental chemicals on children is the reporting required of chemical manufacturers by the federal government. One part of that reporting takes place when the manufacturer is seeking government approval for a product. For a pesticide to gain approval for use, manufacturers are required to follow formal testing procedures to show that the product works as intended and does not present an unreasonable risk to humans or the environment. Tolerances, or legal limits, for the amount of a pesticide which is permitted to be present in food are determined from the information gained during this process. This federal reporting system identified circumstances under which aldicarb, a widely used pesticide, posed a special hazard for children.

**Aldicarb**

Aldicarb is an insecticide that has been used since the 1970s on fruits, nuts, potatoes, and various other vegetables and recently came under increased scrutiny for potential risk to children. Aldicarb acts by inhibiting acetylcholinesterase, the enzyme necessary for the proper transmission of nerve impulses. Chemicals that inhibit cholinesterase can be very toxic to humans. Aldicarb belongs to the class of cholinesterase inhibitors called carbamates. They can cause a number of effects, including diarrhea, blurred vision, vomiting, and changes in the function of the central nervous system.

In 1991, the manufacturer of aldicarb notified the Environmental Protection Agency (EPA) of some unexpected aldicarb residues in bananas. Generally, the residues were below the established tolerance when the bananas were blended together. However, when the bananas were analyzed one at a time, some of these bananas were found to have “hot” levels of aldicarb that were up to 10 times more than the legal limit. Therefore, more than the safety threshold for a whole day’s exposure could occur in a single serving if certain individuals happened to eat one of the “hot” bananas.

After these data were reported, the U.S. Food and Drug Administration (FDA) checked aldicarb levels in bananas as they were used for different purposes. Processed bananas used for baby food
were found to have very low aldicarb levels, probably because the baby foods are made by blending large numbers of bananas. Therefore, children who ate their bananas in that form were relatively safe from high levels of exposure to aldicarb. However, children who ate pieces of bananas or entire individual bananas were more at risk. The levels of aldicarb in some individual bananas were not only well above the legal limit but potentially high enough to make a child acutely ill. EPA's dietary risk assessment found that, for the “hottest” bananas, the allowable daily limit of aldicarb would be exceeded by an adult’s eating more than one-eighth of a banana and by a child’s eating more than one bite of a banana. Even for bananas at the legal limit, just one-third of a banana would be an excess for a toddler and one-seventh of a banana would be above the allowable daily intake for an infant.

This increased risk of exposure for children to high levels of pesticide residue on food is compounded by the typical child’s diet. In general, children’s diets are less varied than those of adults. As a consequence, they eat larger volumes of certain foods per pound of body weight than adults do. A toddler’s eating one banana (a fairly common occurrence) is roughly equivalent to an adult’s eating five bananas, on a body-weight basis. For this reason, children were at greater risk of high levels of exposure to aldicarb than adults.

Based on this information, the manufacturer voluntarily agreed to stop the sale of aldicarb for use on bananas. The registration of aldicarb for bananas has since been canceled. The company also agreed to reduce the amount of aldicarb recommended for use on citrus fruits, but it is still used on some crops. The pesticide is currently undergoing special review for groundwater concerns.

This case study is particularly disturbing in light of the fact that FDA tests about 40 food samples each day for a limited number of pesticides. Because of this limited sampling and the large number of pesticides used, there are many pesticides for which the EPA never tests, and therefore, their prevalence in the food supply is unknown. Aldicarb is one pesticide for which a specific risk has been identified, but the potential for many more such risks to go undetected is real.

### Clinician Diagnosis and Reporting

Environmental risks to children are sometimes discovered by clinicians when treating children with unusual health problems. The following section discusses two examples of environmental effects upon children which were diagnosed by physicians alert to the effects of changes in the environment upon their patients.

### Diazinon

The first example involves an infant in Oregon diagnosed with chronic diazinon poisoning. In December 1989, a routine physical examination at age 12 weeks found that the child had excessive muscle tone in her legs—her leg muscles had increased resistance to stretching (hyper-tonicity). A month later, when symptoms did not improve, the pediatrician consulted a specialist, who examined the infant. At this examination, the hypertonicity was also occurring in her arms and hands, and the consultant suspected that the child had a mild case of cerebral palsy. Treatment and physical therapy for cerebral palsy were begun.

Several months later, the child’s parents informed the physician that the home had been sprayed with an insecticide a month prior to the first examination. An unlicensed applicator had sprayed the home, including the entire area and furniture of some rooms, with the insecticide diazinon. This type of application was a misuse of the pesticide; the diazinon product should be applied only to cracks, crevices, and small areas. The clinician reported the exposure to the state Pesticide
Analytical and Response Center, which began an investigation. Diazinon residues in the home were evaluated, and urine samples were taken from the child and adults in the home for testing for the metabolites of diazinon. Unexpectedly high levels of residues were found in the home, and the child's urine sample showed levels of metabolites of diazinon (alkylphosphate) comparable to levels found in farmworkers who work with this pesticide. The adults' alkylphosphate levels were too low to be detected by the testing. For the child's sake, the family was advised to leave the home. Six weeks after being removed from the home environment, the child no longer exhibited hypertonicity symptoms, and all cerebral palsy treatment was discontinued.

The infant in this case was more vulnerable to diazinon than the adults for several reasons. Because the pesticide was sprayed over entire floor surfaces, it is likely that the child was exposed partly by contact with the floor. Children's contact with the floor is typically more extensive than that of adults because of their height and means of getting around. In addition, infants take in more air for their size than adults and breathe more rapidly, so the airborne particles of diazinon which came from the initial application and from disturbances of the floor surfaces (such as by vacuuming) would be more concentrated in the child's body. Moreover, studies have found that young animals are more susceptible to organophosphate chemicals like diazinon than are older animals, and the existence of a parallel phenomenon in humans is quite possible. 10,11

The unusual feature in this case is that the clinician made the connection between the spraying of the insecticide and the child's problems, even in the absence of effects on the adults in the home and when a different diagnosis had already been proposed and accepted. The clinician also promptly reported the exposure and set in motion laboratory procedures to identify diazinon in the home and to test for metabolites in the child. Even though the child's symptoms were not necessarily the same as those of an adult with similar exposure,12 the cause of the symptoms was identified and the child was removed from the harmful home environment. Under other circumstances, this child might have gone on to have chronic neurological damage from the exposure, and no one would have known why.

This example also shows that, through the use of home and garden pesticides, parents can inadvertently expose their children to much heavier levels of pesticides than they would normally be exposed to in food, water, or air. Despite good intentions, without knowledge of the potential effects of pesticides on their children, parents themselves may be the largest factor contributing to the exposure of their children. Educating parents about the effects of pesticides on children is one important method of decreasing children's exposure.

**Mercury**

The second example concerns chronic mercury toxicity in a child.13 In this 1989
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Case, a four-year-old child from Michigan presented in a clinician’s office with sweating, itching, headaches, difficulty in walking, gingivitis, hypertension, and red discoloration of the palms and the soles of the feet—all symptoms of mercury poisoning. The physician had knowledge of mercury poisoning cases from the earlier part of this century. At that time, medicines and teething powders containing mercury were commonly prescribed for young children. Children who were exposed to large amounts of mercury developed a condition called acrodynia (which means “painful extremities”) weeks or months after exposure. The symptoms of acrodynia include irritability, red discoloration of the hands and feet, pain in joints, heavy sweating, muscle weakness, and difficulty standing or walking. Despite the severity of the effects, it was not until the 1940s that the cause was determined to be mercury poisoning and the use of mercury in medicines for young children was banned. Today it is possible to treat acrodynia, but many physicians are unaware of its existence because it is so rare. This physician, because of his experience, suspected mercury poisoning as the cause of the child’s symptoms and began to search for a source of exposure.

The physician reported the symptoms and his suspicion of acrodynia to the Department of Public Health, which found that the mercury exposure came from the painting of the interior of the child’s home with latex paint just ten days before the child became ill. At one time, biocides containing mercury were added to about one-fourth of interior latex paints in low concentrations to extend the shelf life of the paint and in higher concentrations to make paints mildew resistant. The paint the family used contained a mercury biocide. After the house was painted, the family slept with the air conditioning system on and the windows closed. The mercury in the paint vaporized, and the child and his family breathed it in. When tested, all members of the family had elevated mercury urine levels; however, only the child was symptomatic. He was hospitalized for four months and received treatments to increase the amount of mercury excreted from the body. After treatment, almost all of the symptoms disappeared, and he could walk again.

There are several reasons the child was more vulnerable to mercury inhalation than the adults in this case. As in the diazepam case, children’s higher rate of respiration causes them to take in a greater amount of both air and its contaminants relative to their size than adults (see the article by Bearer in this journal issue). Mercury vapor is also heavier than air, so the area in a room that has the greatest concentration of mercury will be near the floor, where small children play.14

Since 1990, the mercury compound involved has been banned for use in house paints, but this case raises the question of whether there have been a number of instances of similar exposure of children in the recent past that went unrecognized. It also raises a more global question. Chemicals such as mercury were used for many years before their effects became known and their use was banned. How many chemicals currently in use are having other, unknown effects on children?

Multiple Exposures

In addition to exposures from single sources, such as the cases presented here, many children may experience multiple chemical exposures, which are even more difficult to identify and evaluate. Pesticides alone could account for several exposures to an individual child. Suppose, for example, that a child’s home is treated with a pesticide, and others are used to treat the child’s school for pests. Still other
pesticides are in the food the child eats. Over a single day, a child may be exposed to pesticides from many sources, as well as numerous other environmental contaminants.

Illnesses resulting from these multiple exposures are difficult to diagnose and treat for two major reasons. First, several classes of pesticides, such as the organophosphates and carbamates, contain specific chemicals that act in the same way in the body. If a child has an illness caused by a combination of similarly acting chemicals, the source of the contamination causing a particular illness may not be clear. In addition, the effects of exposure to multiple toxins are not well understood, particularly when the chemicals have different modes of action. It is simply not known whether these chemicals inhibit each other or if they are additive or synergistic, multiplying one another’s potential effects on children. Given the large number of chemicals many children are exposed to daily, the task of sorting out the effects of multiple exposures is daunting and has not yet been accomplished. Because of this lack of knowledge, regulations on maximum exposure levels generally have not taken the effects of multiple exposures into account but, instead, treat each exposure as if it occurred in isolation.16

Conclusion

Much is still unknown about the effects of environmental chemical exposures on people, and on infants and children in particular. Filling the information gaps on effects and exposures is essential, but achieving that goal will take time, focused effort, and support for research dedicated to this end. The cases presented here illustrate that, in addition to regulatory agencies, parents, physicians, and others who come in contact with children on a regular basis all have roles to play. Among clinicians, increased alertness to environmental toxicity when making a diagnosis can be a direct route to identifying environmental causes of disease. Parents can help by identifying, and protecting children from, environmental exposures and by advising physicians involved in treating a child’s health problem about possible exposures. Regulators and others who are responsible for environmental safety will have to be particularly sensitive to the increased vulnerability of children, in setting research agendas and regulatory policy and in sharing critical information on risks to children with those who are directly responsible for protecting children.

Given the large number of chemicals many children are exposed to daily, the task of sorting out the effects of multiple exposures is daunting and has not yet been accomplished.

2. According to the Food and Drug Administration, pesticide tolerances for food “reflect a very conservative margin of safety—normally more than 100 to 1,000 times lower than the level that caused ‘no effect’ in test animals.” Farley, D. Setting safe limits on pesticide residues. *FDA Consumer* (October 1988) 6–7.
8. According to the EPA, there are 860 pesticides currently registered in the United States. U.S. Environmental Protection Agency. *Quantities of pesticides used in the United States*. 
Information sheet. Washington, DC: 1994. If an FDA test detects “more than 100 different pesticides” in a single sample, there are many that are not monitored. Farley, D. Setting safe limits on pesticide residues. FDA Consumer (October 1988) 10.


Environmental Policy and Children’s Health

Philip J. Landrigan
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Abstract

Understanding the differences in the effects of environmental contamination on children and adults is an important part of environmental policymaking; however, unless environmental health policies reflect the differences between adults and children, this knowledge will have little practical effect. The authors of this article consider how the unique vulnerabilities of children challenge environmental policymaking. First, they review the biological differences between children and adults, and then they critique the processes of risk assessment and risk management, the principal tools currently used to form federal environmental policy. While these tools are useful in developing environmental health policy, their implementation frequently fails to consider the unique vulnerabilities of children. In light of the potential to improve environmental policy for children, the authors review both the actual and prospective contributions of educational and advocacy efforts in changing the ways policy addresses children’s environmental health, and discuss the interests of industries and the problems of environmental equity. Finally, they present a new approach to environmental health policymaking which places children, rather than individual toxicants and hazards, at the center of the risk assessment and management process.

Children today live in an environment that is vastly different from that of a generation or two ago. While exposures to some environmental hazards have decreased thanks to new regulations and increased vigilance,¹ children are continually in contact with new chemicals in their food, in the air, and in water. They are exposed to thousands of newly developed synthetic chemicals whose toxicity has never been tested and whose potential dangers to children are unknown.² These new exposures, along with the triumphs of vaccines and antibiotics, have changed the face of childhood illness in the developed world. Chronic diseases, some thought to be caused by toxic environmental exposures, have come to replace the classic infectious diseases as major causes of illness and death among children in developed countries. These illnesses, along with complex, chronic handicapping conditions of multiple origins, are known today as the “new pediatric morbidity.”³

This new morbidity includes a broad range of diseases in children. Among these diseases are asthma exacerbated by air pollution and second-
hand cigarette smoke, delayed development caused by lead in paint and contaminated drinking water, and cancers caused by radiation and benzene. Some of these illnesses are acute; others are chronic. Some, such as lead poisoning and asthma, are evident during childhood. But other diseases caused by toxic exposures in childhood may appear only years or decades later after long periods of latency. Examples of the latter category include lung cancer and malignant mesothelioma caused by early childhood exposure to asbestos, or leukemia and lymphoma caused by exposure to benzene in unleaded gasoline.

All of these diseases of toxic environmental origin, no matter whether they are acute or chronic, can in theory be prevented by reducing or eliminating children’s exposures to toxic chemicals in the environment. These diseases arise as a consequence of human activity. Therefore, they can be prevented by modifying that activity.

The articles in this journal issue by Bearer and by Goldman discuss in detail how children are different from adults in an environmental context. These articles provide several case studies showing how children are affected by environmental toxins. This article examines the ways in which the unique environmental exposures and vulnerabilities of children present challenges for environmental policy in the areas of regulation, prevention, education, and research. It also considers the policy implications of children’s vulnerability for communities, environmental advocates, and industry.

In the broadest sense, all of the conditions around us comprise our environment. These include natural phenomena such as the seasons and the weather, the gravitational field of the earth, the air we breathe, the food we eat, the water we drink, our homes, our workplaces, and other people. If this definition is used, environmental health includes topics as disparate as drownings, sunburn, lung cancer from cigarette smoking, and poisoning from pesticides in food.

This article, however, focuses more specifically on contamination of the environment by manufactured chemicals. It examines policies that address contamination produced by human activities and concentrates on toxic environmental exposures that people cannot easily control individually. This definition is useful in a policy context because all of the diseases and health problems caused by manufactured toxins could potentially be avoided by not using the chemicals in the first place, whereas drownings and sunburn have always happened and require different types of interventions.
Children’s Vulnerability to Toxins in the Environment

Children are uniquely vulnerable to environmental toxins. This heightened susceptibility stems from several sources and is reviewed in detail in the articles by Bearer and by Goldman in this journal issue. To summarize:

- **Children have greater exposures to environmental toxins than adults.** Pound for pound of body weight, children drink more water, eat more food, and breathe more air than adults. For example, children in the first six months of life drink seven times as much water per pound as does the average American adult. Children ages one through five years eat three to four times more food per pound than the average adult American. In addition, children have unique food preferences. For example, the average one-year-old drinks 21 times more apple juice and 11 times more grape juice and eats 2 to 7 times more grapes, bananas, pears, carrots, and broccoli than the average adult. Moreover, the air intake of a resting infant is twice that of an adult. These patterns of increased consumption reflect the rapid metabolism of children as well as their growth and development. The obvious implication for environmental health is that children will have substantially heavier exposures pound for pound than adults to any toxins that are present in water, food, or air. This has been demonstrated very clearly in the case of children’s exposures to pesticides in the diet.

- **Two additional characteristics of children further magnify their exposures to toxins in the environment:** (1) their hand-to-mouth behavior, which increases their ingestion of any toxins in dust or soil; and (2) their play close to the ground, which increases their exposure to toxins in dust, soil, and carpets as well as to any toxins that form low-lying layers in the air such as certain pesticide vapors.

- **Children’s metabolic pathways, especially in the first months after birth, are immature compared with those of adults.** As a consequence of this biochemical immaturity, children’s ability to metabolize, detoxify, and excrete certain toxins is different from that of adults. In some instances, children are actually better able than adults to deal with environmental toxins. More commonly, however, they are less able than adults to deal with toxic chemicals and thus are more vulnerable to them.

- **Children are undergoing rapid growth and development, and their delicate developmental processes are easily disrupted.** Many organ systems in young children—the nervous system in particular—undergo very rapid growth and development in the first months and years of life. During this period, structures are developed and vital connections are established. Indeed, development of the nervous system continues all through childhood, as is evidenced by the fact that children continue to acquire new skills progressively as they grow and develop—crawling, walking, talking, reading, and writing. The nervous system is not well able to repair any structural damage that is caused by environmental toxins. Thus, if cells in the developing brain are destroyed by chemicals such as lead, mercury, or solvents, or if vital connections between nerve cells fail to form, there is high risk that the resulting neurobehavioral dysfunction will be permanent and irreversible. The consequences can be loss of intelligence and alteration of normal behavior.

- **Because children have more future years of life than do most adults, they have more time to develop any chronic diseases that may be triggered by early environmental exposures.** Many diseases that are triggered by toxins in the environment require decades to develop. Examples include mesothelioma caused by exposure to asbestos, leukemia caused by benzene, breast cancer that may be caused by DDT, and possibly some chronic neurologic diseases such as Parkinson’s disease that may be caused by exposures to environmental neurotoxins. Many of those diseases are now thought to be the products of multi-stage processes within the body’s cells which require many years to evolve from earliest initiation to actual manifestation of illness. Consequently, certain carcinogenic and toxic exposures sustained early in life appear more likely to lead to disease than the same exposures encountered later in life.
Environmental Policy and Children’s Health

Public Policy Options

Despite children’s extensive exposures and heightened vulnerability to environmental toxins, there is no coherent research or policy agenda in the United States which ensures that America’s children will grow up in a safe environment. Rather, most environmental policies, at both the federal and the state levels, attempt to regulate chemical exposures without reference to children’s health. Most current regulatory efforts represent attempts to balance different and competing interests around potential toxins. New chemicals are introduced into the environment because they are useful or because they are by-products of processes that are considered useful. Too often the toxicity of these materials is untested, and the potential hazards they may pose to children are quite unknown. Environmental policy typically attempts to balance the need to protect individuals and the environment against the benefits that may be realized by the use of potential toxins. Most environmental regulation in the United States is not designed specifically to protect the health of either adults or children.

This section examines options for creating a children’s environmental health policy in the United States. It focuses first on the processes of risk assessment and risk management, the two principal tools that policymakers use to form environmental health policy. Within this framework, it studies successes and failures, policy gaps and impediments to formation of policy. Implications of current approaches to risk assessment and risk management for children’s environmental health are discussed (see Box 1). It concludes by offering an alternative paradigm for control of toxic hazards in the environment designed specifically to protect children’s health.

Risk Assessment

Environmental health policy development begins with risk assessment. Risk assessment attempts to evaluate the hazardous properties of a chemical and to determine the risks that result from exposure to it. In some instances, risk assessment is based on clinical and epidemiologic studies in which the effects of a toxic chemical are evaluated directly in humans. More commonly, risk assessment is based on toxicological studies of a chemical in laboratory animals. The results of risk assessment are often controversial. Frequently, to estimate the risk associated with a chemical, assumptions and extrapolations must be made, and different investigators and scientists may make different assumptions.

The four steps in risk assessment are as follows:

1. Hazard identification: Identify the hazard by observing the health effects it
produces in humans or animals exposed to it. Health effects may be gross and obvious, such as cancer or death, or they may be subtle, such as delays in development or impairment of immune function.

2. **Dose-response assessment**: Assess the relationship between the amount of exposure and the occurrence of the unwanted health effects. For example, what dose of the contaminant produces how many excess cancers? Are health effects more severe at higher levels of exposure?

3. **Exposure assessment**: Evaluate exposure to the toxin in terms of exposure source, extent of exposure, pathways of human absorption, internal “dose,” and the number and kinds of people likely to be exposed.

4. **Risk characterization**: Using information gathered in the first three steps, characterize the resulting risk. Usually this consists of developing a table depicting estimates of the number of excess unwanted health events expected at different time intervals at each level of exposure.9,10

Each of the steps in risk assessment has implications for public policy regarding children’s health and the environment.

**Toxicity testing of chemicals generally fails to consider the special vulnerability of infants and children.**

Hazards can be identified much more efficiently and systematically by testing the possible toxicity of new chemical compounds in laboratory animals before the chemicals are ever utilized in commerce or released into the environment. A major advantage of this approach is that it permits identification of chemical hazards before human exposure, disease, and death have occurred.

**Dose-Response Assessment**

The second step in risk assessment, assessing the dose-response relationship, is of particular importance for children. Unfortunately, there is a distinct lack of information about the effects of most chemicals on the young. Toxicity testing of chemicals generally fails to consider the special vulnerability of infants and children; therefore, it provides little information about the hazards of toxic chemicals in this age group.11 For example, the overwhelming majority of pesticides have never been tested in young animals.4 Testing typically begins at age six to eight weeks, which corresponds roughly to five years of age in humans. Very few studies have been organized in which experimental animals were exposed to pesticides early in life and then followed over a lifetime to assess the late effects of early exposures, the situation that typically occurs in real life when infants are exposed to substantial quantities of pesticides.4 Consequently, little is known of the delayed effects of early exposures to pesticides and other environmental toxins.
Because of this lack of information concerning the effects of chemicals on the young, the population typically used as the basis of risk assessment calculations is adults. Therefore, the level of exposure to a chemical that is considered by regulatory agencies to represent an acceptable risk usually does not take into account the special vulnerabilities of children. For example, federal standards limiting permissible levels of pesticide exposure in foods (tolerance levels) are geared solely to the protection of adults. These tolerances do not account for the fact that children eat foods that are different from those eaten by adults, eat these foods in quantities different from those eaten by adults, and have different biological susceptibilities. When a child eats a banana that contains the legal limit of a pesticide, he or she takes in more pesticide per pound of body weight than would an adult and therefore experiences an exposure per unit of body weight above the limit established as acceptable. Moreover, children eat more bananas than adults. None of this information is reflected in current approaches to risk assessment.

The fact that risk assessments do not usually consider children’s unique risks is a major flaw in the U.S. regulatory system for pesticides in the diet. This flaw could be remedied through changes in the federal regulatory structure.

Of even greater concern is the absolute lack of any information on the health effects of many synthetic chemicals on any segment of the human population, adults or children. An enormous outpouring of new chemicals into the environment has occurred over the past 50 years. More than 70,000 unique chemicals are currently used in industry and consumer products in the United States, and each year hundreds of new chemicals are introduced for commercial use. Reliable information concerning possible health effects is minimal or nonexistent for two-thirds of these substances. Part of the reason for this lack of information is the lack of a strong regulatory mandate. Although the Toxic Substance Control Act (TSCA) of 1976 created a legal mechanism for the testing of each chemical in commerce, in fact there are many inadequacies in the federal testing requirements established under TSCA. For one thing, many thousands of potentially toxic compounds whose introduction to commerce predated passage of TSCA remain untested, and there are no requirements at present for testing many such compounds (requirements for reregistration of older pesticides are an exception).

Several problems have resulted from the lack of information concerning the health effects of chemicals. For example, in the case of pesticides, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) requires that a risk-benefit analysis be performed on each chemical being registered. The Environmental Protection Agency (EPA) weighs the risks to health and the environment against the benefits of the chemicals to the producers. However, when information on the health risks is not available, the process is forced to proceed without full information.

The case of pesticides illustrates another problem with the regulatory system. There are approximately 600 active ingredients in pesticides that have been registered for use with the EPA, and most of those were registered at a time when toxicity testing was not as strict as it is today. Manufacturers have been required to reregister these active chemicals, but retesting takes time and the active ingredients will probably not all be reregistered before the year 2000. In the meantime, these pesticides are still available for use and are being used. In addition, the non-active (inert) ingredients in pesticides are considered to be trade secrets. Therefore, they are not required to be registered or tested, despite their widespread distribution. The term “inert” is misleading. It means only that the chemical is not toxic to insects and does not refer to possible effects on human health. Yet many of these “inert” chemicals are, in fact, likely
to be human toxins; they include organic solvents, petroleum products, and diesel fuel. Despite this lack of complete information on pesticides, particularly the inert ingredients, there is far more information available about their toxicity than about the toxicity of most other commercial chemicals. Pesticide regulations require pre-use approval, while regulations of other chemicals are more end of the line, regulating only after first measuring the effects of chemicals on the air or water.\(^\text{14}\)

Of course, even if every chemical made in the United States were thoroughly tested and controlled, children would still be exposed to chemicals from imported goods, particularly in food as well as in air that crosses borders. There is no way to eliminate all risk, but reducing risk is a worthwhile, if difficult, proposition. Testing by itself is expensive, and having government agencies shoulder the costs may not be realistic. Building those costs into product development by having producers perform or pay for testing before new products can be introduced might be a feasible way to finance these activities and, thus, to improve risk assessment.\(^\text{12}\) In fact, many chemical manufacturers already engage in intensive premarket testing.\(^\text{12}\)

**Risk Characterization**

The fourth step, risk characterization, must be based on the information gathered in the first three steps and upon scientific assumptions where information is not directly available. When the risks to children are different from those to adults, the risk characterization should differentiate between children and adults. However, because of data gaps in the previous steps, usually no information about the risks to children is included in the analysis. Thus, risk characterization often ignores children. Then, when regulations or other policy steps are taken to control risk, children’s interests are left out of the process.

Another difficulty with risk characterization is that, in the many instances where information from the previous steps is lacking, the overall characterization of the risk must be based on a series of educated guesses. While use of such assumptions is often unavoidable, it is essential for the assessors to make them explicit in their reporting. Policymakers and the public need to know the assumptions that underlie the assessors’ decisions. The provision of a range of estimates, based on different assumptions, may be more appropriate than providing a single estimate. No matter how it is done, the characterization of the risk by the risk assessor is the key to risk management strategy. If the process has taken children’s unique physiological and behavioral vulnerabilities into account, then the assessor can include assessment of the risks to children in the report to the risk management agency.

Historically, chemicals and toxicants are regulated one at a time; even classes of chemicals known to act in similar ways in the human body are not grouped together in regulations. In a theoretical world, this singular approach may make sense. However, in the world of a child, it bears...
Children are often exposed to a myriad of environmental hazards, often simultaneously, in varying doses at different stages of their development.
Box 2

Existing Environmental Regulations

**Licensing laws**

The Federal Food, Drug, and Cosmetic Act (FFDCA) controls levels of environmental contaminants as well as substances added to and naturally occurring in food, drugs, and cosmetics. It also provides for the setting and enforcement of tolerances on pesticide residues for food and feed crops, regulates introduction of new drugs and biologics, and requires cosmetics to be labeled.

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) provides for the registration of pesticides with the Environmental Protection Agency. It requires that pesticides not cause unreasonable risk of injury to human health or the environment.

The Toxic Substances Control Act requires testing of existing chemicals where data are inadequate to assess risk of injury to human health or the environment. It also prohibits the introduction of new chemicals that present an unreasonable risk and restricts or prevents the production, use, or disposal of existing chemicals that present unreasonable risk.

**Standard-setting laws**

The Clean Air Act sets standards for air quality, vehicle emissions, fuels, and fuel additives. It also requires the EPA to regulate emissions of hazardous air pollutants and to conduct research on air pollution.

The Clean Water Act sets maximum contaminant levels (MCLs) and maximum contaminant level goals (MCLGs) for public drinking water supplies. The MCLGs do not consider feasibility, but MCLs do.

The Consumer Product Safety Act promulgates consumer safety standards, balancing risks against the cost, utility, and availability of the product.

The Federal Hazardous Substances Act bans hazardous substances that may cause substantial personal injury or illness from use in households.

The Occupational Safety and Health Act sets standards for contaminants in the workplace which may cause a “material impairment of health or functional capacity.” The act attempts to attain the highest possible degree of occupational health and safety protection.

**Control-oriented laws**

The Comprehensive Environmental Response, Compensation, and Liability Act along with the Superfund Amendments and Reauthorization Act funds cleanup of hazardous waste sites, designates reportable quantities of toxins for environmental release, reports on community preparedness and release, and mandates the EPA to prepare toxicity profiles on contaminants. These acts focus on the highest risk chemicals, where there is “substantial danger to the public health or welfare.”

The Lead-based Paint Poisoning Prevention Act mandates the Consumer Product Safety Commission to determine, if possible, a safe level of lead in paint to prevent the poisoning of children by lead-based paint.

The Poison Prevention Packaging Act promulgates standards for packaging substances that could produce serious personal injury or serious illness. The Consumer Product Safety Commission is mandated to determine the degree and nature of the hazard to children from the packaging of poisonous products.

The Resource Conservation and Recovery Act regulates the handling of hazardous wastes and lists hazardous wastes on the basis of their constituents in order to “protect human health [from] . . . serious irreversible or incapacitating reversible illness [and] . . . substantial present or potential hazard.” The act also controls handling to minimize risks.

Act charges the Consumer Product Safety Commission to determine a safe level of lead in paint, if possible, to prevent childhood lead poisoning. The Poison Prevention Packaging Act, enacted in 1970, sets standards for the packaging of substances that could be harmful to children. To prevent personal injury or illness among children, packaging must make it “significantly difficult for children under 5 years of age to open or obtain a toxic or harmful amount of the substance therein within a reasonable time.” Of course, the act regulates only packaging, and careless use of substances such as medications or cleaning fluids by parents and caretakers will not protect children from poisoning.

It is unfortunate that the regulations which explicitly include children are not global in scope but, instead, are aimed at controlling specific substances. While the necessity of controlling lead and harmful medications should not be underemphasized, taking children’s health explicitly into consideration in the major environmental regulations which consider all pesticides (such as FIFRA) or all water pollutants (such as the Clean Water Act) would have a far more widely beneficial effect on children’s health. Happily, there are some instances where children are indirectly considered in global statutes, and progress is slowly being made in taking children into account in some regulations. For example, the Clean Air Act does specifically consider children. Under the Clean Air Act, as discussed in Box 2, the EPA and other federal regulatory agencies are required to set standards for permissible levels of toxins in air which will protect “the most vulnerable members of society.” Because the most vulnerable are often children, this language serves, implicitly at least, to protect children.

In addition, standards for lead in air set under the Clean Air Act have addressed concerns about the effects of lead on the health of children beyond lead-based paint. Lead has been known by pediatricians to be a toxic substance since the end of the nineteenth century, but in the United States, it was widely used for many years, most notably in gasoline. It was concern for the protection of children that led to the establishment under the Clean Air Act of the current federal ambient standard for lead in air of 1.5 mg/m³. This standard coupled with the phase-down of lead in gasoline has produced an 80% reduction over the past 15 years in the blood lead levels of American children. This represents one of the great recent successes in pediatric environmental health in the United States.

**Monitoring**

After a risk has been characterized through risk assessment and a management structure for it has been established in regulations, the level of the toxin present in the environment must be monitored so that the regulations can be enforced. Although standards are most often set federally, states and localities monitor federal standards on ambient environmental and source discharges. Thus, to monitor compliance with the Clean Air Act, the EPA and state environmental agencies monitor levels of pollutants in air. For acutely toxic air contaminants such as ozone or the components of smog, measurements are made on a daily or even an hourly basis. When permissible levels are exceeded, smog alerts are issued. For chronic air toxins such as lead, quarterly average air lead levels are published. Pesticide levels in foods are monitored regularly by the FDA. If a shipment of food is found to contain excessive levels of a pesticide, the shipment can be seized and destroyed.

The type of monitoring required by environmental regulations varies from substance to substance. The particular type chosen can have large implications for children. Pesticide monitoring is an example. Often pesticide levels are measured only in large batches of food. However, within a batch, the pesticide may be spread unevenly; the levels in some units will be very low while those in other units will be very high. If a child consumes...
just one portion of a batch and that portion is heavily contaminated, then the monitoring efforts do not serve to protect that individual child because the reported result represents the average contamination in the whole group of food products, not in an individual portion. For example, in the case of aldicarb on bananas discussed by Lynn Goldman in this journal issue, the level of aldicarb on one banana might be high, but the testing programs for this pesticide previously analyzed groups of bananas, not individual bananas. Foods that are not processed in large batches might need to be tested differently from foods that are processed and blended together.

In assessing children’s exposure to environmental toxins, the sampling strategy is very important. Again, pesticides provide an example. Under current sampling procedures, it is very difficult to assess the dietary exposure of children to pesticide residues because food consumption data collected by the U.S. Department of Agriculture examine consumption among children only within very broad age groups. Because there is substantial variation in the diet of children as they age, food consumption data need to be collected within narrower age brackets. In addition, pesticide residue data collected by the U.S. Environmental Protection Agency typically do not focus on the foods that are most commonly consumed by children.

Surveillance of the effects of contaminants on people is another aspect of managing risks. The collection of data on health problems is one way to obtain information about which children are suffering from which diseases. Several national surveys undertake this task for the entire U.S. population. Unfortunately, most health data collection systems are not specifically designed to collect data on the environmental exposures or toxic diseases of children and, therefore, are not well equipped to support pediatric environmental health policy initiatives.

Perhaps partly because of this drought of data, research into the diseases of children has paid scant attention to environmental causes of illnesses. Although an enormous body of literature has accumulated around a few well-known environmental problems in children, such as lead poisoning, pesticide intoxication, and, more recently, air pollution, there is no concerted research agenda to assess systematically the effects of most environmental toxins upon the health of children. Because of this lack of targeted health research, many pediatric environmental toxins have undoubtedly escaped scrutiny, and diseases have not been recognized as
environmentally related. Environmental sources of illness should receive increased priority and consideration when decisions are made regarding the funding of research on children’s health.

**Education**

Several kinds of educational efforts might ultimately decrease the exposure of children to environmental contaminants. The first type is education of health care professionals. Medical education has paid scant attention to issues in pediatric environmental health, and this lack of training is reflected in most providers’ inability to recognize environmental health problems. In the four years of medical school, the average American medical student receives only six hours of training in environmental medicine. \(^{19}\) Even pediatric residency programs provide little education on topics in environmental health except perhaps on the most fundamental and popularly acknowledged problems such as lead poisoning. Not surprisingly, therefore, most physicians and other primary medical providers in the United States are not knowledgeable about even the most common problems in environmental health, and it is likely that many illnesses of environmental origin are undiagnosed. \(^{20,21}\)

Some attempts are being made to improve the state of environmental medical education and its close cousin, occupational medicine. The Institute of Medicine has convened several committees to increase the dissemination of information on the teaching of occupational and environmental medicine to medical students, residents, and physicians. \(^{20}\) Several federally funded programs have been initiated to increase and expand occupational teaching and experience, such as the Environmental Physician Academic Achievement Award of the National Institute of Environmental Health Sciences. The Agency for Toxic Substances and Disease Registry has also supported the development of training materials and research fellowships in environmental medicine. \(^{19}\) One example is the course titled Kids and the Environment: Toxic Hazards developed by the Children’s Environmental Health Network, which has been introduced into four pediatric residency programs in California. \(^{22}\) The principal thrust of these efforts has been to integrate environmental medicine into mainstream internal medicine and pediatrics so that physicians consider environmental diseases in formulating their differential diagnoses. \(^{21}\)

A second type of education is direct education of parents and children and the public about ways to protect children from environmental contaminants. Public understanding can be advanced through the print and electronic media, in parenting or prenatal classes, or just by word of mouth. Parents who are informed about the risks of a contaminant for their children can be powerful actors on their children’s behalf. When public sentiment is behind a group of involved parents, their influence is increased.

Education of policymakers is very important. Advocacy groups for environmental health have had particular success in communicating their concerns to policymakers. Among these groups are the Natural Resources Defense Council (NRDC), the Children’s Environmental Health Network, Physicians for Social Responsibility, and the Colette Chuda Environmental Fund. Because they do not vote and are not able to speak for themselves, very young children are not considered actors in the policy arena. Therefore, adults must take up policy issues that concern the health and welfare of children.

**The Role of Advocacy**

Unfortunately, most parents and communities have limited access to comprehensive, usable information regarding the effects of environmental toxins on children’s health. Researchers inform each other by disseminating findings in scientific journals but seldom translate “data” into plain language for lay audiences. \(^{23}\) Non-English-speaking and minority
communities are most excluded from the transfer of information.

An extensive grassroots advocacy movement has developed recently in the United States, centered on issues in pediatric environmental health. The goals of this movement are to educate parents and families about environmental hazards to children, to support research (such as a recent study by the Natural Resources Defense Council on children’s exposure to environmental carcinogens), and to effect changes in public policy.

Community groups have become increasingly effective at making impacts at the local level. Local coalitions have joined forces to change many different types of community policies. For example, local coalitions across the country have been key forces in the enactment of local ordinances restricting smoking in restaurants, hospitals, and public places. A coalition of community groups in Oakland, California, called People United for a Better Oakland (PUEBLO) pioneered development of the country’s first local lead abatement ordinance. A national group of parents whose children have been lead poisoned (Parents United Against Lead) are working to educate other parents and policymakers about lead hazards. Other parent groups are working to decrease or eliminate the use of pesticides in schools and promote integrated pest management, and to pass local tobacco control ordinances. Concerns about the locations of hazardous waste sites and incinerators have become front-line issues for many communities, particularly communities of color.

In several instances, community groups have identified health problems before the scientific community and helped formulate the steps toward solutions to the problems they believed were caused by environmental exposures. For example, the Akwesasne Mohawk Community in New York, the Brownsville Community Health Center in Brownsville, Texas, and the People for Community Recovery in Chicago all played significant roles in identifying and moving to change the environmental exposures in their communities.

Advocacy movements have also been effective on the national level. Their impact is often strengthened through alliances with the medical community or governmental regulatory agencies, as happened in the Alar episode (see Box 3). However, there is still a tremendous need for more interaction and communication among the medical, research, and policymaking communities and those parents, children, and community members who have firsthand experience with environmental exposures and potential solutions.

Involvement of Industry

Industries, particularly those that produce or use synthetic chemicals, have a particular interest in environmental health policy. Many face economic problems in the disposal of those chemicals and must make decisions about where and how to store hazardous wastes. The Resource Conservation and Recovery Act makes the producer of a hazard responsible for it from “cradle to grave,” regardless of whether the material is in the hands of the producer all the time. The Clean Air Act limits release of airborne toxins. The Toxic Release Inventory makes information available to the public on each company’s release of toxins to air, water, and landfills. These types of regulations have a definite effect on industrial practices, and the effects can be both good and bad for the people who are touched by a particular factory or industry. Data from the Toxic Release Inventory have been used by local governments and community groups to force reductions of toxic releases by industries.

An example of the conflicts that can result from a policy of considering children’s specific vulnerability arises in the context of occupational regulation of exposure to lead. At the present time under the Occupational Safety and Health Act (OSHA), the U.S. Safety and Health Administration permits adult workers of...
either gender to be exposed to lead in the workplace so long as blood lead levels do not exceed 50 micrograms per deciliter (µg/dl). The U.S. Supreme Court has affirmed the right of women, including women of childbearing age, to work in such environments. Recent data from the pediatric literature indicate that lead is toxic to the fetus at blood lead levels as low as 10 to 20 µg/dl. Blood levels in this range have been linked to development of permanent neurobehavioral impairment in young children, and because the placenta affords no barrier to the passage of lead from mother to child, blood lead levels in newborn babies and their mothers are virtually identical. In addition, clinical reports from the first half of this century described increased incidence of spontaneous abortion in female lead workers and in the wives of male lead workers.26 Thus, a dilemma exists. Present law permits women to work in an environment where their unborn children can suffer lead poisoning. How do we balance the desire to work with the protection of health?

One answer is to reduce the biological exposure standard for lead in the workplace to a value below 20 µg/dl for workers of both genders. Then mothers will be protected, unborn children will be protected, and male workers who, in fact, are at risk of neurological, cardiovascular, and reproductive damage at blood lead levels above 20 µg/dl will also be protected against the toxic effects of lead.27 However, this option, while appealing from a health point of view, has economic implications for the industries using lead and the workers exposed to it. The question is whether reducing lead in the workers’ environment will prove too expensive to justify continued employment in that industry. Although adults who work in potentially hazardous occupations may do so voluntarily, the same cannot be said of the children who may be damaged by prenatal and take-home exposure to lead and other toxins.

Box 3

### Alar: A Failure of Regulation

Alar, a synthetic chemical widely used on certain food crops (especially apples) from 1968 until 1989, acts as a growth retardant, delaying crop ripening and thus prolonging shelf life. The compound was not adequately tested for toxicity before it was introduced in the United States. Indeed, limited toxicity data that were circulated around the time of Alar’s registration suggested that the compound was carcinogenic. However, those data were ignored. Subsequently, toxicity studies using limited data indicated that Alar produced several different types of tumors, but these studies were also overlooked. Meanwhile, the product remained on the market.

In February 1989, scientists with the Natural Resources Defense Council (NRDC), an environmental advocacy group based in Washington, DC, released a report concluding that children were at risk from pesticides in food and that Alar presented the greatest risk to preschoolers. A vigorous counterattack was launched by the pesticide-manufacturing industry, which claimed that the NRDC findings were inaccurate and alarmist.

Further assessment of Alar was undertaken by the U.S. Environmental Protection Agency (EPA). In this evaluation, the carcinogenicity of Alar was confirmed, thus supporting the NRDC findings. The American Academy of Pediatrics wrote to the EPA to urge that the sale of Alar be suspended, and citizen groups such as Mothers and Others used the national attention to communicate their concerns about Alar to the public. The manufacturer discontinued sales of Alar in late 1989, and all EPA tolerances for Alar expired in 1991. In 1993, the National Academy of Sciences completed a study of the risks of pesticides in food to infants and children. It found that current U.S. federal regulations do not adequately protect children from pesticides in food.

The tragedy of the Alar episode is that it was entirely unnecessary. Proper premarket testing would have prevented 24 years of children’s exposure to this potent carcinogen and would have prevented the food scare that occurred in 1989.
Thus, although effective environmental policy may frequently require a balancing of interests, it may be particularly appropriate for policymakers to advance the interests of children in such situations as occupational exposure to lead because children cannot represent their own interests.

**Environmental Equity**

Another area of concern in pediatric environmental health is the unequal distribution of exposures to toxic hazards among children of different racial, ethnic, or socioeconomic groups. Published reports as well as anecdotal evidence suggest that poor children (and adults) and children of color are heavily, and often disproportionately, exposed to a multitude of toxic environmental hazards. Published reports as well as anecdotal evidence suggest that poor children (and adults) and children of color are heavily, and often disproportionately, exposed to a multitude of toxic environmental hazards. Approximately 37% of African-American children, 17% of Hispanic children, and 6% of white children living in inner-city neighborhoods had elevated blood lead levels (above 10 µg/dl). By contrast, the proportion of white middle- and upper-class children in suburban and rural areas with blood lead levels above 10 µg/dl was less than 3%. It has been hypothesized that the level of lead in paint and gasoline has resulted in high concentrations of lead in urban soils and, thus, in the high prevalence of elevated blood lead levels in inner-city children.

Lead is the classic example of disproportionately high and adverse human health or environmental effects on minority and low income populations in the United States. In that same year, the New York State Board of Regents on Environmental Quality in Schools affirmed the right of all children to be taught in a safe learning environment and of children, parents, and school employees to know about environmental health hazards in the school environment (see Box 4).

Thus, although effective environmental policy may frequently require a balancing of interests, it may be particularly appropriate for policymakers to advance the interests of children in such situations as occupational exposure to lead because children cannot represent their own interests.

**Box 4**

**New York’s Policy on Environmental Quality in Schools**

A happy exception to the general lack of an overall policy for protecting children is a policy that was developed in New York by the State Board of Regents on Environmental Quality in Schools. The guiding principles of this enlightened policy are that:

- Every child has a right to an environmentally safe and healthy learning environment which is clean and in good repair.
- Every child, parent, and school employee has a “right to know” about environmental health issues and hazards in the school environment.
- School officials and appropriate public agencies should be held accountable for providing an environmentally safe and healthy school facility.
- Schools should serve as role models for environmentally responsible behavior.
- Federal, state, local, and private sector entities should work together to ensure that resources are used effectively and efficiently to address environmental health and safety conditions.

that there are several causes for differences in exposure of children from different racial, ethnic, and socioeconomic groups to environmental hazards is a first step to reasonable policymaking. In some instances, environmental safeguards appear not to be well enforced in poor neighborhoods. For example, a recent study suggested that EPA standards are less stringently enforced in poorer communities than in wealthier ones so that the poorer communities are not receiving the same regulatory protections. In other instances, hazardous situations may arise in poor neighborhoods because of illegal and reckless disposal of toxic materials. In still other instances, differences in exposure may arise because of a sorting of families from different economic or ethnic groups into more- or less-safe environments. For example, poor children in inner-city neighborhoods tend, for economic reasons, to occupy older, frequently inadequately maintained housing units that years ago were painted with lead-based paint. Therefore, they are more likely to be exposed to environmental lead from peeling lead-based paint than are children in families that can afford to move out of such conditions. Thus, the added risk of lead exposure faced by children in the inner city results in part from incomplete remediation of an environmental hazard which at one time affected children of all socioeconomic groups.

Regulations requiring a more equitable distribution of hazardous waste facilities are one approach to the problem of environmental inequity. However, any policy that increases the real and substantial risks borne by some children in the name of equity cannot seriously be considered to be satisfactory. Rather, policies that reduce the exposure for all children are much more desirable. Certain policies can address and reduce existing exposures. For example, policies can promote abatement of contamination resulting from hazardous waste facilities, increase funding for innovative programs that reduce the risks posed by known sources of environmental toxins, and require strict enforcement of environmental protection statutes and regulations in all communities. Other policy options can protect all children from future exposures, by using technology and chemical substitution to decrease pollution and risks to nearby residents (known as source reduction) and by eliminating the sources of the hazards completely, thus preventing exposure.

A New Approach to Protecting Children from Environmental Toxins

The current paradigm for risk assessment and risk management places the toxicant or hazard at the center of the discussion; examines known data on effects, routes of exposure, and mechanisms of action; and from this analysis, develops permissible exposure levels. But what if children, not the toxicant, were placed at the center of the paradigm? A host of different questions would be asked: What is the child exposed to? How is the child exposed and at what stage of development? What are the effects of acute exposures or long-term low-level exposures? What are the delayed effects? What are the effects of multiple and cumulative exposures? What are the transgenerational effects? Using this paradigm, data would need to be collected and analyzed based on children’s exposures, not extrapolated from adult data as is done now.

The current fragmented approach to controlling children’s toxic exposures mirrors the complex and poorly coordinated federal structure used to establish regulations and protective standards. The current fragmented approach to controlling children’s toxic exposures mirrors the complex and poorly coordinated federal structure used to establish regulations and protective standards. The Environmental Protection Agency, because its statutory responsibilities are established in numerous policies developed by Congress, has no overarching mission. It is difficult to set priorities within the agency when the various statutes require different and sometimes conflicting standards to be enacted. Furthermore, there are numerous agencies that regulate toxins, such as the Food and Drug Administration and
the U.S. Department of Agriculture. Rarely are policies coordinated on an intra- or inter-agency level.

Initial approaches to achieving a new child-centered paradigm in environmental health include the following:

1. Develop structures that foster federal interagency coordination and collaboration, such as a federal interagency task force to review and coordinate regulation and policy on pediatric environmental health.

2. Review and evaluate current environmental legislation and regulations to determine if children are included and are adequately protected. Amend any environmental laws undergoing reauthorization to require specifically that environmental standards incorporate consideration of children and other special subgroups.

3. Ensure that henceforth children are specifically included in every new piece of environmental regulation and legislation.

4. Develop new risk assessment models to incorporate the most sensitive populations.

5. Increase research on pediatric environmental health to acquire more data on environmental hazards affecting children and to better understand exposure patterns. Foster more collaboration between the National Institute of Environmental Health Sciences and the National Institute of Child Health and Human Development.

6. Require toxicity testing of chemicals to assess long-term effects of exposure in early childhood, and transgenerational effects. Thus, the extent of children’s exposure to these chemicals will almost certainly continue to increase. The problem is not going away. The challenge, therefore, is to design policies that specifically protect children against environmental toxins and allow children to grow, develop, and reach maturity without incurring neurologic impairment, immune dysfunction, reproductive damage, or increased risk of cancer.

This challenge of addressing children’s unique environmental vulnerabilities is not met in current public policy in the United States. There is no general policy at either the federal or the state level to ensure that our children will grow up in a safe environment. Environmental regulation and regulatory risk assessment typically fail to consider the unique exposures and special vulnerabilities of children. Indeed, most environmental legislation fails to consider children and their special vulnerabilities.

We suggest a new paradigm for developing environmental health policy centered on the needs and exposures of children. The essence of this paradigm is to place the child, not the chemical or hazard, at the center of the analysis. The analysis would then begin with the child, his or her biology, exposure patterns, and developmental stage. This paradigm calls for a new way of thinking, and a retooling of the risk assessment process so that it takes into account not only the increased vulnerability of children but also the effects of multiple and cumulative exposures over the course of a lifetime.

Solutions need to be developed at all levels—federal, state, and local. In the best of all possible worlds, there would be cross-fertilization of ideas and model policies. At the federal level, the above recommendations can be enacted through legislation, an executive order, appropriations, or regulation. At the state level, policies can be reviewed to determine if children are included and protected. Locally, groups of parents, advocates, and other interested citizens can work to develop model strategies and policies to protect their children from environmental exposures.

**Conclusion**

The protection of children against environmental toxins is a major challenge to our society. Hundreds of new chemicals are developed every year and released into the environment, and many of these chemicals are untested for their toxic effects. Thus, the extent of children’s exposure to these chemicals will almost certainly continue to increase. The problem is not going away. The challenge, therefore, is to design policies that specifically protect children against environmental toxins and allow children to grow, develop, and reach maturity without incurring neurologic impairment, immune dysfunction, reproductive damage, or increased risk of cancer.

This challenge of addressing children’s unique environmental vulnerabilities is not met in current public policy in the United States. There is no general policy at either the federal or the state level to ensure that our children will grow up in a safe environment. Environmental regulation and regulatory risk assessment typically fail to consider the unique exposures and special vulnerabilities of children. Indeed, most environmental legislation fails to consider children and their special vulnerabilities.

We suggest a new paradigm for developing environmental health policy centered on the needs and exposures of children. The essence of this paradigm is to place the child, not the chemical or hazard, at the center of the analysis. The analysis would then begin with the child, his or her biology, exposure patterns, and developmental stage. This paradigm calls for a new way of thinking, and a retooling of the risk assessment process so that it takes into account not only the increased vulnerability of children but also the effects of multiple and cumulative exposures over the course of a lifetime.

Solutions need to be developed at all levels—federal, state, and local. In the best of all possible worlds, there would be cross-fertilization of ideas and model policies. At the federal level, the above recommendations can be enacted through legislation, an executive order, appropriations, or regulation. At the state level, policies can be reviewed to determine if children are included and protected. Locally, groups of parents, advocates, and other interested citizens can work to develop model strategies and policies to protect their children from environmental exposures.
Danger exists in the current era of government downsizing and regulatory reform that children will become even less well protected against environmental hazards than they are today. We urge policymakers to consider the implications for human health and national productivity that may be associated with increased and unchecked exposure of America’s children to lead, air pollution, pesticides, and untested consumer chemicals of unknown toxicity. While short-term concerns about regulation of the business community certainly need to be heard, the immediate and longer-term effects of environmental degradation on the health of America’s children need to be weighed in the balance.

As we move toward the twenty-first century, the issue of environmental exposure and degradation looms large not only in this country but globally. It is imperative that we develop policies which will protect the health of our children now and in the future.


18. More recently there have been efforts to use market-based mechanisms for controlling lead. In California, for example, a tax was added to the manufacture of lead-based products, which was earmarked for abatement programs.


30. While several reports showed that hazardous waste disposal facilities are more likely to be located in African-American and Hispanic communities than in white communities, other investigations have found less support for the idea. Anderton, D.L., Anderson, A.B., Oakes, J.M., and Fraser, M.R. Environmental equity: The demographics of dumping. *Demography* (May 1994) 31, 2:229–49. However, even though the extent of the inequities is not agreed upon by researchers, that some communities bear greater burdens of environmental exposure should be a concern to policymakers.


32. Examples of differences with regard to the way in which EPA standards are enforced in poorer communities include opting for containment instead of permanent treatment or removal of the hazard, greater delay in placement on the Superfund priority list, and more reduced penalty imposition in communities of color than in white communities. Hollenbeck, K.J. Environmental justice. *The Recorder* (Autumn 1994), pp. 8–14.

Effects of Welfare Reform on Teenage Parents and Their Children

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Abstract

A key question in welfare policy concerns the potential that welfare-to-work programs have to develop in teenage parents the motivation and skills to provide financially for themselves and their children. The Teenage Parent Welfare Demonstration was a major experiment initiated in 1986 by the U.S. Department of Health and Human Services and evaluated by Mathematica Policy Research, Inc., to test the impact of a welfare-to-work program for teenage parents which anticipated many features of the federal Job Opportunities and Basic Skills training program later established in the Family Support Act of 1988. Teenage mothers entering the welfare system were randomly assigned to a regular services group or to an enhanced services group. Teen mothers in the enhanced services group faced mandatory school and work requirements enforced by financial sanctions and received support services such as case management, parenting workshops, child care assistance, and education and training opportunities.

This article reviews the policy context in which the Teenage Parent Welfare Demonstration was designed and implemented, and describes how participation in the enhanced services group affected the teen mothers as adults and as parents. Results showed that, for the reasonable aggregate annual cost of $2,400 per participant, the program increased the teenagers' attendance at school and job training programs, and modestly increased the proportion who were employed to 48%, compared with 43% among those receiving regular welfare services. As the participants' earnings from employment increased, their welfare grants shrank. Because these changes offset each other, the program did not improve the economic well-being of the families, although fewer tax dollars were needed to support them. The program did not discourage further childbearing, however, or affect either the parenting behavior of the young women or the development of their children, although the mothers who were most engaged in self-sufficiency activities were more positive and supportive when playing with their children.

The Teenage Parent Welfare Demonstration experience revealed that the problems faced by teenage parents vary widely, making tailored services necessary. The evaluation results suggest that supportive, mandatory welfare-to-work interventions need not harm parents or their children in the short term, and that their modest positive effects on the financial independence of the teenage mothers may yield long-term rewards.
Welfare reform is on the public agenda, as policymakers at the state and federal levels design strategies that promise to reduce the cost of public assistance by discouraging out-of-wedlock births and by assisting welfare recipients to find work. Aid to Families with Dependent Children (AFDC), the cornerstone of the welfare system, was established to provide benefits for children in families with no breadwinners, and two-thirds of those who receive benefits are children. As a result, welfare reform initiatives designed to affect the behavior of adults—by reducing benefits or by increasing employment, earnings, and skills—will directly affect the lives of young children. Although there have been many experiments with welfare reform, few have systematically examined the effects of alternative policies on the parenting role of adults or on their children. One notable exception is the federally funded Teenage Parent Welfare Demonstration, which combined the threat of benefit reductions with services designed to support the teenagers as workers and parents and which is the focus of this article.

The Challenge of Welfare Reform

The nation’s welfare system is characterized by leading policymakers, practitioners, and recipients alike as a system that fosters long-term dependency and offers limited direct assistance to those eager to become self-sufficient. In 1993, AFDC supported almost 15 million individuals each month, including 9.6 million children, at a cost of about $28.1 billion. A rapid rise in caseloads, continuing upward trends in child poverty rates, and concerns about state and federal budget deficits have led to widespread bipartisan demands for welfare reform. The Clinton administration has proposed to achieve this goal by promoting parental responsibility for the support of children, changing the welfare and tax systems to “make work pay,” demanding that all welfare recipients who can work do so, and placing time limits on welfare eligibility. Other proposals, from the states and Congress, include provisions that would deny cash benefits to teenage parents under age 18, eliminate benefit increases for children born after a family first comes onto welfare, and institute a lifetime limit on the receipt of welfare benefits.

Substantial evidence suggests that most welfare recipients would welcome an opportunity to provide for themselves and their families through work. However, they confront problems in finding jobs that pay well, arranging and paying for child care, finding transportation, and retaining their jobs. Many lack the skills demanded by employers for well-paid jobs, and the job training programs available to them have proven to be marginally effective. As many as half receive such low scores on tests of basic skills that they are precluded from even entering many training programs.

The subgroup of welfare recipients that are most often singled out for attention are teenage parents. A large body of research conducted by sociologists, demographers, and economists has examined links between early childbearing and later income, education, marriage, fertility, and employment. Young women who become parents as teenagers often find themselves on trajectories that result in more reliance on public assistance and less engagement in the workforce. Teenage mothers who work are less likely than older women to have full-time jobs, to be stably employed, and to earn incomes adequate to support a family. A recent report by the General Accounting Office states that 42% of all families receiving AFDC at any given time were begun by a mother who was under the age of 20 when she gave birth. Other researchers report that teenage parents who receive welfare...
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depend on it for an average of two years longer than do older first-time recipients, increasing policymakers’ interest in welfare reform initiatives that target this group.

The importance of helping teenage parents embark on a path that will lead them toward self-sufficiency goes beyond the financial savings that should result from reduced welfare rolls. Child developmentalists who study how the timing of parenthood affects children suggest that the children of teenage parents fare less well in school readiness and high school performance than do children born to older women.\(^{19,20}\) One comparison showed that black youths with teenage mothers were 1.5 to 2.5 times more likely than those with older mothers to experience delinquency, early sexual activity, teenage pregnancy, grade failure, running away from home, and other behavioral problems.\(^{15,16}\) Later changes in the family’s circumstances also affect outcomes for children born to teenage mothers. For instance, one group of researchers has followed the lives of more than 300 low-income African-American mothers in Baltimore who gave birth as teenagers in the late 1960s.\(^{15,23}\) Researchers found that the early arrival of siblings hampered the school readiness of the first-born children of teenage parents. However, children whose mothers left welfare before the children began high school performed better in school than those whose mothers remained welfare-dependent.\(^{21,25}\) Events such as subsequent births and employment appear to affect not only the life chances of a mother, but also those of her children.

**Policy Responses at the State and Federal Levels**

Propelled by concerns about rising AFDC costs and its apparent ineffectiveness at improving the prospects of recipients like teenage parents and their children, policy interest in welfare reform grew throughout the 1980s. The Teenage Parent Welfare Demonstration described in this article was one of the largest of a number of experiments implemented to learn what might be required to help welfare recipients move into the world of work.\(^{26}\) Begun in 1986, the Teenage Parent Welfare Demonstration anticipated the provisions aimed at teenage AFDC recipients that would be included in later national welfare reform legislation, giving an early window into the impacts welfare reform might have on this vulnerable population.

The first attempt to reform the federal welfare system in more than two decades took shape in the Family Support Act of 1988. This legislation broke new ground by conveying the expectation that mothers with young children should engage in out-of-home activities that would increase their capacity to provide for themselves and their children. It endorsed the idea that welfare should be a transitional program involving mutual obligations: the government has a responsibility to help welfare families work toward self-sufficiency, and the parents in these families have an obligation to help themselves even while their children are young.

In keeping with these principles, the legislation established the Job Opportunities and Basic Skills (JOBS) training program to provide education and training to adult welfare recipients and facilitate their transition to employment and self-sufficiency. Key features of the JOBS program are mandatory participation in employment-directed activities by adult recipients whose children are three years of age or older, mandated school enrollment for teenage parent recipients, access to education and job training programs, assistance in finding employment, and subsidies for child care services during participation in approved training or employment activities.\(^{27}\)

The federal government required only modest participation rates in the Family Support Act, however, and the states were slow to build up their JOBS programs. Pressures on state welfare budgets limited state investments in the program, and so
states tapped no more than 70% of the federal matching funds allocated for the JOBS program in 1993. Despite the fact that teenage parents are to be a priority group for JOBS services, few states have worked aggressively to get out-of-school teenage parents back in school. A contributing factor may be ambivalence on the part of public officials regarding the economics, ethics, and implications of requiring that welfare recipients with young children engage in activities outside the home.

Early experience from studies of state- and foundation-initiated welfare demonstrations suggests that it may be possible to change the welfare system to emphasize self-sufficiency by offering, as President Clinton has said, “a hand up, not a hand-out.” For instance, studies have found that welfare recipients view JOBS participation mandates as fair and reasonable if they are associated with real services to assist individuals in working toward self-sufficiency. Clear participation expectations and strong case management services seem to be most successful in promoting employment and earnings gains.

Clear participation expectations and strong case management services seem to be most successful in promoting employment and earnings gains. Special JOBS programs that link teenage parents to employment and training services, and provide child care and support services to them have been examined in a number of reports, as well. The methods for providing child care assistance range from provision of free care in on-site centers to referrals to child care in the community, to subsidy approaches that pay the cost of any type of child care, including that offered by relatives. Detailed evaluations of practical experience with program implementation can serve as an important guide to the development of new strategies.

The Teenage Parent Welfare Demonstration

In 1986, two years before the Family Support Act was passed, the U.S. Department of Health and Human Services initiated the Teenage Parent Welfare Demonstration to test a new model of welfare which might stem the burgeoning of welfare caseloads by reducing teenage childbearing and improving the employment incentives and prospects of teenagers who do have babies. Three principles undergirded this model: (1) parents have primary responsibility for their own health and welfare and for the health and welfare of their children; (2) the government has an obligation to help welfare-dependent mothers overcome barriers to self-sufficiency; and (3) intervention should begin early, before welfare dependency patterns develop.

Demonstration programs were established in Chicago and at two sites in New Jersey (Camden and Newark). At each site, teenage parents eligible for welfare who were assigned to the demonstration group received the maximum grant only if they actively pursued skills and experience that would boost their earnings potential and promote their self-sufficiency. Special program offices administered the new welfare requirements and provided comprehensive services to reduce the barriers that impeded the young mothers’ participation in required activities. Thus the demonstration programs linked education, job training, and employment opportunities for the young mothers to services such as child care, parenting supports, and case management assistance that addressed the needs of children, following the model of two-generation programs.

The Teenage Parent Welfare Demonstration was designed as an alternative approach to routine welfare services which should apply to all the teenage parents entering the welfare system at each site, not only to individuals who might volunteer to receive special assistance in redirecting their lives toward self-sufficiency. By contrast, most previous program initiatives targeted volunteers. Each Teenage Parent Welfare Demonstration program identified all teenage mothers of a single child when they applied to receive AFDC and enrolled all who completed applications into the experiment (approximately 6,000 mothers over the two-year demonstration period). About half of these
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young mothers were randomly assigned to participate in the enhanced services program in their city, and the remainder were assigned to a control group who received regular AFDC services. This article summarizes information gathered after two years on the effects that the demonstration programs had on the activities, educations, earnings, and childbearing of these young women42,46,47 and on parenting behavior and child outcomes.48

Program Components

Participation in self-sufficiency activities was mandatory for those individuals assigned to the enhanced services group. To continue receiving their full welfare benefits, these young mothers had to develop and comply with approved plans for engaging in school, job training, or employment. Case managers worked with 50 to 80 young women at a time and helped them decide what education or training to pursue, found open slots in education and training programs, coached them to persist in their plans, and counseled them when problems arose.49 They also helped the young mothers find child care, deal with personal and family crises, and take advantage of program and community support services. If a young mother failed to persist in her planned activities despite the program’s help in addressing obstacles, the case manager applied financial sanctions by cutting her welfare benefits by the amount normally allocated to the mother’s needs. For instance, the young mother’s monthly AFDC grant (in 1991, a mother with one child received $322 in New Jersey and $268 in Chicago) would be reduced by about $160 until she resumed participation.

Early on, participants were required to attend workshops focusing on personal skills, their new parental responsibilities, and the demands they would face in later education, training, and employment activities.50 Program staff linked participants to education, training, and employment services both in-house and in community agencies. All three programs offered classroom high school equivalency (GED) courses, on-site job readiness workshops, referrals to counseling, and job skill training provided in other agencies. Each program also conducted problem-solving workshops to help selected participants cope with particular problems or pursue particular goals. After the initial workshop series, case managers helped the participants handle parenting issues on an individual basis, and they occasionally made home visits.

The programs provided child care and transportation subsidies to participants, and they paid for training and education expenses such as uniforms, registration fees, and tools. Parents who used licensed child care centers and approved family child care providers could receive child care payments, and when they were at the program site they could use on-site child care. The Chicago and Newark programs provided specially equipped child care rooms, and in the Camden program staff members were available to care for children on an as-needed basis.37,38

Aggregate resource costs, including the costs of community-provided education and job training services, were about $2,400 a year for each young mother.

The costs of the demonstration program were relatively modest. About $6.8 million covered operating costs at all three sites, including $4.1 million in federal demonstration funds.51 Total expenditures for the four years of program operations averaged about $2,000 for each of the approximately 3,500 participants. Aggregate resource costs, including the costs of community-provided services such as alternative education and job training services, were about $2,400 a year for each young mother. This sum included about $500 per person for child care and transportation services, including the on-site child care facilities in Chicago and Newark.

The Participants

As mentioned above, the demonstration’s target population consisted of all teenage mothers beginning to receive AFDC who had only one child or who were in the third trimester of a pregnancy. Although only 6% to 17% of new AFDC applicants at
the three sites were teenage parents, because they typically depend on welfare for a long time, past experience suggests that they would eventually make up about half of the welfare caseload at each site. The Family Support Act, passed after this demonstration was well under way, made participation in JOBS activities mandatory for AFDC recipients between 16 and 19 years of age who had dropped out of school. Roughly one-third of the Teenage Parent Welfare Demonstration participants fit those criteria and would be considered mandatory participants in the JOBS program, and another third were likely to become mandatory when they reached 16 or dropped out of school. The JOBS program would not require participation of the final third because they had either completed high school or were older than 19. They were, however, required to participate in the Teenage Parent Welfare Demonstration activities.

As a group, the mothers in the demonstration were highly disadvantaged, and virtually all faced significant barriers to self-sufficiency (see Table 1). They were young, averaging 18 years of age, and 5% were 15 or younger. About 30% had dropped out before completing high school, and most who were still in school were behind grade level. Some 55% to 60% of the demonstration participants had reading scores below the eighth grade level, which is the minimum level often required for participation in Job Training Partnership Act (JTPA) job training courses. More than half of the young mothers had had some work experience. One-third reported child care problems, and one-fourth cited transportation problems that had limited their employment options. Many of these teenage mothers had left their parents’ homes; only about half were living with other adults who potentially could offer economic and social support. Only one-third received financial assistance from the child’s father (30% received child support, 4% lived with the father). The profile of teenagers in this sample is one of young mothers who clearly need a great deal of help if they are to make progress toward economic self-sufficiency.

**Research Questions and Procedures**

The demonstration was designed to address a number of important policy questions. At the most basic level, it sought to increase understanding of the size and characteristics of the population of teenage parents on welfare. Even today, most state welfare agencies cannot review their caseloads and distinguish the teenagers in AFDC households who are themselves parents from those who are not. Little is known about the particular strengths and service needs that characterize the teenage parent population.

Another central goal of the demonstration concerned the feasibility of implementing a universal-coverage, mandatory employment and training program for young parents on welfare. Could states design and operate programs on a sufficient scale to meet the needs of all their clients? Could they develop enough education and training opportunities, and address adequately the child care needs of large numbers of infants? How important and effective would the financial sanctions be in promoting program participation among this special population?

The ultimate questions posed by the architects of the demonstration concerned whether this reformed welfare program would reduce significantly the incidence of long-term welfare dependency. In the short run, this meant looking at the effects of the program on progress toward self-sufficiency. Did the reformed welfare program promote higher levels of participation in activities such as school or job training? Did the young mothers in the reformed system experience higher employment and earn more? Did they delay subsequent childbearing? Were they likely to receive greater financial assistance from the fathers of their children as a result of special efforts by the welfare program to establish paternity and secure child sup-
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port awards? Over the longer run, the evaluation will also reveal beneficial or harmful impacts on children that might result from the mothers’ activities outside the home, their parenting behaviors, or their decisions concerning child care.

The evaluators used a multipronged approach to answer these questions. They gathered baseline information from 5,297 young mothers prior to their assignment into the regular or the demonstration welfare programs and made site visits to observe the programs. A follow-up telephone interview was conducted with 3,867 randomly selected mothers about 30 months after they enrolled in the demonstration, with a response rate of 88%. In addition, 70 mothers responded to in-depth interviews, 88 participated in focus group discussions, and the experiences of 46 were discussed in case conferences with program staff. The evaluators also reviewed state agency administrative records to gather longitudinal data on the young mothers’ receipt of AFDC, food stamps, child support, unemployment compensation, and wages. Finally, a special study involving interviews and videotaped observations conducted at one of the sites assessed parenting abilities and styles, and aspects of the children’s development. From these multiple sources of data, a picture emerges of how the Teenage Parent Welfare Demonstration was implemented, the experience of the teenage parents in the demonstration, and the short-term effects of the demonstration on the mothers and their children.

### Table 1

The Teenage Parent Welfare Demonstration Program: Characteristics of the Participants at Program Enrollment

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>18 years</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>17%</td>
</tr>
<tr>
<td>Black, non-Hispanic</td>
<td>76%</td>
</tr>
<tr>
<td>White, non-Hispanic/other</td>
<td>8%</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
</tr>
<tr>
<td>Never married, not cohabiting</td>
<td>92%</td>
</tr>
<tr>
<td>Living together, married or not</td>
<td>4%</td>
</tr>
<tr>
<td>Separated, widowed, divorced</td>
<td>4%</td>
</tr>
<tr>
<td>Age of youngest child</td>
<td>10 months</td>
</tr>
<tr>
<td>Living with parents</td>
<td>48%</td>
</tr>
<tr>
<td>Family received welfare during childhood</td>
<td></td>
</tr>
<tr>
<td>Most/all of the time</td>
<td>29%</td>
</tr>
<tr>
<td>Occasionally to half the time</td>
<td>33%</td>
</tr>
<tr>
<td>Never</td>
<td>38%</td>
</tr>
<tr>
<td>Non-English-speaking</td>
<td>3%</td>
</tr>
<tr>
<td>Completed high school/GED</td>
<td>33%</td>
</tr>
<tr>
<td>Ever held a job</td>
<td>52%</td>
</tr>
</tbody>
</table>

Sample includes 5,297 teenage mothers who applied for AFDC at three sites: Camden, New Jersey; Newark, New Jersey; and Chicago, Illinois.

Mothers’ Responses to the Program

No program takes place in a vacuum, and the interviews and focus group discussions brought to light many differences in the ways the teenage mothers responded to the opportunities and demands of participating in a welfare-to-work program. All the young women lived in poverty, often in dangerous neighborhoods that provided relatively few role models to guide them toward social and economic independence. They differed considerably, however, in personal characteristics, such as motivation, cognitive skills, self-esteem, and social support, which can impede or facilitate their participation and progress. Examples of these differences are offered here to bring the experiences of the participants to life, and comments by the participants are included in Box 1.

Experiences with Education

As a group, the 30% who were high school dropouts faced the greatest barriers to self-sufficiency. Some had extremely poor basic skills and no family resources to support them; many confronted barriers compounded by deep personal problems, dysfunctional home situations, and welfare system entrenchment. Others had dropped out of school because of transitory circumstances—for instance, when the pregnancy coincided with another major family crisis—and they were more responsive to the program’s pressure to return to school.

Similar contrasts were found among groups of mothers who had more success and stronger attachments to school. Some of the mothers had enough ambition or family support to remain in school after

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Box 1

In Their Own Words: Participants in Welfare Reform Programs Describe Their Experiences

**On pregnancy**

“I didn’t plan it, and then again I kind of knew that it was going to happen because I wasn’t like really taking the pills like I was supposed to. I couldn’t remember every day to take a pill. And I still don’t.”

**On motherhood**

“I like being a mom. I love my son. Nothing could change that. He’s—how can I say it? I don’t know. He’s everything to me anyway. I don’t care about nothing else but him, how he is.”

**On child care**

“I have to know the person real good to let them take care of the baby because these days you can’t trust a lot of people taking care of babies. I would be scared. These days, baby-sitters abuse little kids and you don’t know it until you find out for yourself.”

**On mandated participation**

“At first I didn’t go. They used to send me letters and call me. I still wouldn’t go. And then they sent this man [a case manager] out to my house. And, I was like, I’ll go and see what it was about. Then the first time I went, I didn’t like it because they would ask me little personal questions. Then, after I did that, I never came back, and they came out to my house again and called. ‘Could you please come to the program?’ And I finally went, and then after I went, I liked it. I really liked it then.”

**On achieving self-sufficiency**

“I’m happy I got a job because I was on welfare and I was tired of staying home waiting for the first of the month check, and there wasn’t enough for me and my child. Then when I got a job I was happy because it keeps me out of being bored and being responsible for my kid. I’m making money and supporting my kid. It shows me to be more responsible.”

**On the future**

“I might have a child years from now. My daughter will probably be in high school by then. I want to get my life together. I want to be married, have a good husband, a good home, and know I could afford another one.”
giving birth; others needed the assistance provided by the demonstration program to maintain attendance. In still other cases, even the program’s support failed to keep the teenagers enrolled in school. The high school graduates varied as well. Some already had the skills they needed to pursue employment or higher education, but they lacked motivation or faced family problems and other impediments. Others, on the path to self-sufficiency, took advantage of program resources to expedite their achievement of this goal.

Resiliency and Determination

In spite of the difficult circumstances in which they were living, many of the mothers were highly motivated to improve their own lives and to provide their children with a better childhood than they had experienced. Almost none of the young mothers envisioned permanent dependence on welfare. On the contrary, there was a strong and almost universal hatred of it. Many of the teenagers who participated in the focus groups commented that women on welfare often become “addicted” to receiving public assistance and, over time, lose the motivation and ability to care for themselves.

Child Care

As new parents, the teenagers were inexperienced with child care. Although the demonstration programs helped participants find and pay for licensed child care, many young mothers reported they were afraid to trust a stranger to care for their children and would not even consider care provided by nonrelatives. Ultimately, most of the young mothers were able to rely on relatives to care for their babies. While they were generally satisfied with the child care arrangements they made with relatives, recent research raises concerns that the quality of the care provided by relatives may compare poorly with the quality of licensed forms of child care.

Child Support by Fathers

Only a handful of mothers in the sample cooperated with the efforts of child support enforcement agencies to secure support payments from the children’s fathers. Half of the mothers who were interviewed in person indicated that they were in touch with the fathers of their babies, who provided groceries, diapers, and baby clothes, or small amounts of cash. Yet, the young women felt that it was in their best interest not to cooperate with child support enforcement agencies. Many who received no child support stated that they preferred to have nothing further to do with the babies’ fathers.

Repeat Pregnancies

Although most of the young mothers wanted to postpone further childbearing until they were more financially secure, many acknowledged having problems managing their fertility. Two years after program enrollment, two-thirds of the mothers had experienced a repeat pregnancy.

Two years after program enrollment, two-thirds of the mothers had experienced a repeat pregnancy.

Rewards of Parenthood

The young mothers emphasized the positive aspects of having a child. Their children provided a source of love and affection, enhanced their self-esteem, and made them feel more mature and responsible. Given the limited rewards many teenage parents derive from their lives, these benefits of motherhood can seem quite powerful to them. Some saw working or attending training programs as interfering with their parenting responsibilities. Most teenagers, however, felt it was not only acceptable but desirable to work before their children started school, primarily because they wanted to provide for their children’s needs.

Program Design and Implementation Lessons

The experience of implementing a large-scale, supportive welfare-to-work program for this population of young parents
afforded many lessons relevant to future initiatives in welfare reform.54

**Staff Commitment**

To implement a mandatory program successfully, welfare staff members had to accept an approach that required teenage mothers to go to school, job training, or work, and that imposed consequences on mothers who failed to accept this responsibility, even though it meant the mothers had to leave their babies in the care of another person for substantial blocks of time. This represented a major shift in thinking for those staff accustomed to approving AFDC benefits for mothers who stayed at home.

The program staff also had to recognize and deal creatively with the problems that prevent some young mothers from maintaining a full-time schedule of work or school, spending project resources to resolve those difficulties. For instance, when one case manager visited the home of a young mother with poor attendance, she found the mother and her partner were sleeping in shifts at night to guard the baby’s crib from rats. The case manager helped the couple find better housing, and the young woman began attending program classes. Specialized training was needed to prepare staff who were experienced with adults to work supportively with a teenage population.

**Flexibility**

Services for teenage parents—those offered by community agencies as well as by the program itself—had to be tailored to respond to individual circumstances that often changed rapidly. For instance, many teenage parents would not return to their former high schools for a variety of reasons, including boredom, embarrassment, and conflicts with school staff; yet many also found it difficult to enter educational programs focused on adults. Imaginative programs that combined academics, work experience, and intensive personal attention seemed to work best at sparking their interest and commitment. Schedule flexibility was also imperative to enable the teen mothers to deal with sick children, child care breakdowns, transportation problems, and other crises.

**Child Care Support**

This demonstration underscored that any program intent on engaging teenage mothers in out-of-home activities must deal sensitively with their child care needs. Money to pay for care is needed by those who cannot use free care by relatives: 60% of those who used paid care relied on the subsidies provided by the program. However, most of these young mothers were acutely aware of the widely publicized (if rare) incidents of child abuse in child care settings, and they were reluctant to leave their infants with anyone whom they did not know well and trust. Moreover, the part-time nature of the mother’s activities often prevented her from using center-based child care, and the difficulty of using public transportation when carrying a baby and a day’s worth of baby supplies limited the choice of child care to the immediate neighborhood, where quality was questionable.38,55,56 Subsidies were only part of the child care assistance needs of this population.

**Program Impacts on the Behavior of Mothers**

The Teenage Parent Welfare Demonstration program showed that it is possible to achieve high rates of participation in activities oriented toward self-sufficiency—such as education or job training—so long as program staff members are committed to work with the young mothers to remove the barriers they face and are willing to use financial sanctions constructively to underscore the responsibilities of parenthood.57 Table 2 shows the program’s effects on the mothers—their involvement in education and employment, their incomes, their ties to the fathers of their children, and their subsequent childbearing.
The three programs succeeded in enrolling nearly 90% of the teenage mothers they targeted. However, this high enrollment rate rested on the emphasis given to mandatory participation requirements and on the efforts of case managers to coax, pressure, and cajole troubled and uncooperative teenage parents into joining the program. Only one-third of these young mothers responded to routine notices about the program participation requirements, but follow-up communications and threats of grant reduction increased the percentage joining the program by an additional 50 points. The 10% who did not complete the enrollment process did not receive any welfare benefits; they were not considered AFDC recipients.

More than 80% of the mothers in the enhanced services group developed a self-sufficiency plan which established long-term goals and specified the steps required to move toward these goals, such as attending school, enrolling in job training, or finding work. Through persistent monitoring and provision of assistance by case managers, the programs were able to keep...
between 40% and 60% of the teenage mothers involved in approved activities each month. Over the course of the two-year program, two-thirds of the young mothers in the enhanced services group received formal warnings that they were in jeopardy of having their grant reduced, and one-third suffered a grant reduction. The majority of those warned or sanctioned subsequently came into compliance with the participation requirements. Participation in program activities was highest among those who entered the program with relatively strong basic skills, were still enrolled in school, did not have any health problems, were black, or lived at home with nonworking mothers.

The two-year demonstration programs improved the life chances of many of the teenage parents they enrolled. Among the program participants, rates of school attendance, job training, and employment increased compared with those for the mothers in the regular services group, while the mothers in the control group faced their challenges with little assistance. The differences between the groups were all statistically significant, though most were only modest in size. The teenage mothers who were assigned to the enhanced services program were considerably more likely to be enrolled in school (41% versus 29% of the regular services group attended school). They were also somewhat more likely to be receiving job training (27% versus 23%), and more of them held a job at the end of the two years (48% versus 43% in the regular services group).

Understandably, the programs increased school attendance most among younger mothers, those with low basic skills, and those who had not graduated from high school. Their impacts on job training and employment were especially large among participants who began with higher basic skills and among older youths. Program impacts on all three self-sufficiency activities (school enrollment, job training, and employment) were the largest among Hispanic participants, the group who were least likely to succeed without the assistance the program provided. Of the Hispanics in the enhanced services group, 42% attended school, 25% took job training, and 42% had a job. The comparable percentages for the Hispanics in the regular services group were 21% in school, 17% in job training, and 25% employed.

Gains in earnings that averaged $23 per month followed from the increased employment among the mothers in the enhanced services group. Also, the combination of those increased earnings and the financial sanctions imposed on the mothers who failed to participate as expected reduced the amount of public assistance received by the program group. They averaged $21 less in AFDC benefits and $2 less in food stamps. As a result, program involvement yielded little or no overall change in the economic welfare of the teenage mothers.

The programs did not succeed in convincing the teenage mothers to limit or delay repeat pregnancies and births, even though they offered specific services, such as family planning, intended to affect childbearing directly. Nor did the participants in the enhanced services group secure more financial support from their children’s fathers. Both childbearing decisions and negotiations concerning child support are more personal than choices about education and employment, yet they also influence a teenage mother’s prospects for self-sufficiency. In future endeavors with this population, efforts should be made to strengthen those aspects of the intervention which deal with family planning and parenting to minimize the challenges to success in school and employment posed by continued childbearing.

Effects of Participation on Parenting Behavior and on Children

The evaluation of the Teenage Parent Welfare Demonstration went beyond assessing the mothers’ abilities to move
toward self-sufficiency to determining whether participation in welfare-to-work activities had positive or negative effects on the parents’ behavior with their children and on the development of the children themselves. Unintended negative consequences for children could result if the stress of juggling work and childcare leads mothers to spend less time with their children or to be harsh or unresponsive. On the other hand, self-sufficiency activities might enhance parenting skills if they include parenting classes or if they increase the mother’s confidence and feelings of efficacy. To explore the effects of program participation on parenting and child outcomes, the researchers conducted an observational study of 182 mothers and their three- to five-year-old children, all of whom were African American, from the Newark site. The sample included mothers from the enhanced services program and from the group that received regular services for AFDC recipients. The mothers were very disadvantaged; only 20% had finished high school after their two years in the Teenage Parent Welfare Demonstration, and 40% had worked.

Researchers visited the mothers and children at home to conduct interviews and videotape play sessions in which the child tried to complete a puzzle that required help from an adult. During the play session, observers noted the mother’s use of harsh control (authoritarianism) and her negativism toward the child. They also recorded the child’s enthusiasm, persistence, and anxiety. In addition, the mothers rated their children on checklists of sociability and mental health problems, and the evaluators administered a standard brief test of verbal ability, the Peabody Picture Vocabulary Test (PPVT-R).

The results of comparisons on these outcomes showed that being assigned to the mandatory enhanced services program did not influence the behavior of the mothers or children during the play session, nor did it affect the children’s development. The mothers in the enhanced services program were neither more positive with their children nor more negative and harsh. Their children did not behave differently in the play sessions or differ on the other developmental measures. Policymakers may be encouraged by the suggestion that mandating participation in self-sufficiency programs like the Teenage Parent Welfare Demonstration does not, in itself, impose hardships that express themselves in negative parenting or problems for children. On the other hand, these results also suggest that, in the short term, welfare-to-work programs do
little to enhance the development of the children of poor teenage parents.

Of course, mothers in both groups participated to differing degrees in self-sufficiency activities. To determine whether involvement in education, job training, or employment affected parenting overall, the program and control groups were combined. The videotapes of the mothers who did not participate in any self-sufficiency activities were compared with those who were moderate or very active participants. Here a number of differences emerged (see Figure 1). The mothers who were involved in activities outside the home were less controlling, less negative, and more engaged when they played with their children than were the mothers who were not involved in school, job training, or work. The children of the more active mothers, in turn, showed more enthusiasm and persistence as they played and completed the puzzle task.

While these results are likely to reflect preexisting differences between the mothers who are motivated to take advantage of self-sufficiency opportunities and those who remain indifferent, they also fit with the idea that both employment and preparation for work can be a positive influence in the daily lives of poor adults and their families.59,60

### Conclusion

The Teenage Parent Welfare Demonstration experience yields lessons that can be useful to policymakers eager to reform the welfare system. This effort showed that large-scale, supportive welfare-to-work programs for teenage parents can be implemented at relatively modest cost through typical human service agencies. The program’s participants were not volunteers but representative samples of the teenage parents coming onto welfare in three cities. Consequently, the demonstration staff experienced the full spectrum of opportunities and challenges facing young parents as they attempt to move to a more stable and independent lifestyle, and the comprehensive evaluation provided further insights into the social, psychological, and economic forces that shape these young mothers’ lives.

The demonstration program’s combination of mandatory requirements and supports increased participation by teenage parents in activities thought to promote human capital development and self-sufficiency, such as school, job training, and employment. Moreover, the demonstration showed that, if a mandatory participation requirement for teenage parents is coupled with supportive case management and other social services, it need not add to the stress on young, poor mothers. Nor does that requirement appear to harm their parenting or their preschool children’s development. Nonetheless, causing no harm is not the same as providing benefits.

These findings suggest that welfare reformers who hope to replicate or improve on the outcomes of the Teenage Parent Welfare Demonstration should focus their efforts in several areas: (1) communicate clear expectations about the need for education, training, and employment; (2) recognize and flexibly respond to the diverse needs and abilities represented in the teenage parent population; (3) be prepared to solve practical problems that keep teenage mothers from fully participating in activities that promote self-sufficiency; and (4) build in direct supports for both parent and child development, if the aim is to improve the life chances of the children of poor, teenage parents.

Because the Teenage Parent Welfare Demonstration anticipated major features of the Family Support Act, these findings have direct relevance to current debates about ways to build on the strengths and address the weaknesses of the JOBS program established by that legislation, the nation’s most recent effort to reform the welfare system. In contrast, they offer little guidance as to the likely effects of the more drastic provisions now under discus-
The top graph demonstrates that the group of mothers who did not become involved in self-sufficiency activities were more authoritarian and more negative when dealing with their children as they tried to solve a puzzle task than were the mothers who were minimally or very involved in those work and training activities. The bottom graph shows that the children of those inactive, negative mothers were less enthusiastic and persistent as they worked with the puzzles. The sample includes 182 mother-child pairs from both the enhanced and regular services groups at the Newark site.

sion, such as two-year time limits on receipt of benefits and withdrawal of cash assistance for the children born out of wedlock to teenage parents. As policymakers, program designers, and the public consider such harsh and untested welfare approaches, they would be wise to take advantage of the understanding of welfare reform yielded by years of careful social experimentation and evaluative research on programs like the Teenage Parent Welfare Demonstration.

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Alice Michael.


33. Pawasarat, Quinn, Stetzer. Evaluation of the impact of Wisconsin’s LEARNFARE experiment on the school attendance of teenagers receiving Aid to Families with Dependent Children. Milwaukee: Employment and Training Institute, University of Wisconsin, 1992.


57. This section draws heavily on work cited in note no. 46, Maynard, Nicholson, and Rangarajan.

58. This section draws heavily on work cited in note no. 48, Aber, Berlin, Brooks-Gunn, and Carcagno.


Abstract
Discussions about immigration, focused on such policy issues as labor force participation and use of welfare programs, frequently fail to include considerations of children’s well-being. Even those debates which center on programs that benefit children—such as schools, public assistance, and social welfare programs—are often based on issues related to short-term costs and societal impacts, neglecting considerations of the well-being and future contributions of immigrant children. Hence, immigrant children have been rendered largely invisible in policy spheres. Yet first- and second-generation immigrant children are the fastest-growing segment of the U.S. population under age 15.

In this context, the Board on Children and Families of the National Research Council and the Institute of Medicine convened a workshop on immigrant children and families to review what is known about this population and to identify issues that warrant further examination. This article is based on the discussions at the workshop.

Several themes emerged from the workshop, including the value of looking at immigrant children in the context of their families; the importance of understanding public concerns over the costs of immigrants, coupled with the difficulty of pinpointing just what those costs are; and the need for policymakers to address such policy issues as education and health care. The article concludes by identifying a number of areas in which research is warranted as immigrant children and families grow to become a core part of American communities, schools, and society.

The United States is experiencing an influx of immigrants not seen since the historic immigration boom at the turn of the century. During the 1970s and 1980s, 17 million immigrants entered the United States, more than double the number that had arrived during the four preceding decades. The immigrants coming to America’s shores today are more diverse than ever before, arriving from an extremely broad spectrum of countries, encompassing an unprecedented range of linguistic backgrounds, and increasingly of non-European origin (see Box 1). In
many instances, they also face more limited economic opportunities than did earlier waves of immigrants. In addition, today’s newcomers are arriving as tighter constraints on government budgets appear to be causing growing numbers of Americans to question the costs of social welfare services, education, health, and other programs for immigrants, especially illegal immigrants. In the discussions that surround this contentious subject, attention has focused on a number of policy issues, from immigrants’ labor force participation to their reliance on welfare. Amid the fray, children—lacking voting powers and unable to choose where they live—have been rendered largely invisible. Although much of the public debate about immigration focuses on programs that benefit children—the schools, public assistance, and social welfare—discussion remains riveted on issues of short-term costs and societal impacts, to the neglect of considerations of the well-being and future contributions of immigrant children. Yet first- and second-generation immigrant children are the fastest-growing segment of the U.S. population under age 15.4

It is in this context that the Board on Children and Families of the National Research Council and the Institute of Medicine convened a group of researchers and policymakers whose work focuses on issues crucial to immigrant children and their families, with a special emphasis on the preschool and school-age years, for a two-day workshop.5 The goals of the workshop were to assess the state of knowledge about immigrant children and families, including its articulation of today’s pressing policy questions, and to identify critical topics that warrant in-depth examination as this area of research develops, emphasizing those that promise to advance both the research enterprise and public policy on immigrant children and families. The principal aim was to review what is known and to raise issues for the future, not to make recommendations toward resolving those issues. This report is based on the deliberations at this workshop and on supplementary materials provided by the workshop participants.

Throughout the workshop and in this article, the terms immigrant children and children of immigrants refer to children who are newborns to age 18 who come to the United States with their parents, and U.S.-born children of parents who immigrated to the United States. The 1990 census counted 2.1 million foreign-born children in the United States; adding second-generation immigrants boosts the number of children to more than 5 million as of 1990.5
Immigration Terms

**asylee**: a noncitizen in the United States or at a port of entry who is unable or unwilling to return to his or her country of nationality or to seek the protection of that country because of persecution or a well-founded fear of persecution (persecution or the fear of persecution may be based on the person’s race, religion, nationality, membership in a particular social group, or political opinion); there is a limit of 10,000 adjustments of noncitizens to asylee status per fiscal year.

**bilingual education**: schooling in which those not fluent in English are taught subjects in their own language.

**circular migration**: the circumstance in which immigrants to the United States travel back and forth between the United States and their countries of origin.

**diversity**: variation; used in reference to the growing cultural, ethnic, and linguistic variation of the U.S. population.

**first-generation immigrant**: an immigrant to the United States who has not been preceded by his or her parents or other family members.

**humanitarian admission**: the process by which immigrants are admitted to the United States for humanitarian reasons, such as suffering human rights abuses in the country of origin; usually involves asylees and refugees.

**illegal immigrant**: an immigrant who enters the United States illegally (that is, without an invitation) or without inspection, or who enters legally (as a visitor, student, or temporary employee) but then fails to leave when his or her visa expires (see visa overstayer); also called undocumented immigrant.

**immigrant children, children of immigrants**: individuals from birth to age 18 who come to the United States with their parents or other family members, and U.S.-born children of parents who emigrated to the United States before those children were born.

**legal immigrant**: an immigrant who enters the United States as a legal permanent resident and who, after five years of continuous residence, is eligible to apply for citizenship.

**LEP**: limited English proficiency, used to describe the linguistic ability of students who have difficulty reading, writing, speaking, and/or understanding English.

**refugee**: any person outside his or her country of nationality who is unable or unwilling to return to that country because of persecution or a well-founded fear of persecution (persecution or the fear of persecution may be based on the person’s race, religion, nationality, membership in a particular social group, or political opinion); refugees are exempt from numerical limitation and eligible to adjust to lawful permanent resident status after one year of continuous presence in the United States.

**second-generation immigrant**: the U.S.-born child of a first-generation immigrant; as a U.S. citizen, eligible to receive certain benefits on the same basis as citizens.

**selective migration**: the circumstance in which immigrants who choose to come to the United States are not representative of the full spectrum of citizens in their country of origin due to factors influencing their decision to migrate, such as higher (or lower) education levels.

**undocumented immigrant**: see illegal immigrant.

**visa overstayer**: a noncitizen who enters the United States on a visa that allows him or her to stay for a limited period of time, then overstays that limit; considered an undocumented, or illegal, immigrant.
Immigrant Children and Their Families

Between 1987 and 1990, 1,031,752 foreign-born children (persons under age 20) came to the United States. Most of the immigrant children and their families who arrive in the United States today come from Mexico, Central and South America, and Asia (particularly Vietnam, Cambodia, and Laos).

Yet other newcomers arrive from other countries—so many, in fact, that more than 100 languages are spoken in the school systems of New York City, Chicago, Los Angeles, and Fairfax County, Virginia.

Immigrant children and their families come to live in the United States permanently via one of three modes of entry: legal immigration, humanitarian admission (as refugees and asylees, statuses that are also legal), or illegal entry (as either visa overstayers or undocumented immigrants). The vast majority (85%) of the foreign-born living in the United States are in the country legally.

Most immigrant children and their families live in six states (California, Florida, Illinois, New Jersey, New York, and Texas), and most live in metropolitan areas. According to the U.S. Department of Education, 78% of all recent immigrant students attend school in just five states (California, Florida, Illinois, New York, and Texas), with 45% enrolled in California. National estimates of growth in the immigrant student population provide an especially compelling glimpse of the future face of America: the total school-age population is projected to grow by more than 20%, from 34 million in 1990 to 42 million in 2010; it is estimated that children of immigrants will account for more than half of this growth. The number of children of immigrants will rise to 9 million in 2010, representing 22% of the school-age population.

An overriding theme of the workshop concerned the critical importance of examining immigrant children in the context of their families. Family reunification is a central reason for immigration today, and many new immigrants arrive in family groups. Family relationships help define immigrant children’s experiences in the United States, including their eligibility for some social and economic resources. This contrasts with turn-of-the-century immigrants, typically male adults who arrived in America unmarried or left their families behind until they got settled.

Moreover, the development and experiences of today’s immigrant children cannot be understood apart from family roles. Family structure and dynamics are key indicators of children’s well-being and include such considerations as whether the family unit is headed by one parent or two, how many members of the family work, the role of older siblings in helping younger children adapt, children’s roles in serving as a critical link between their parents and the larger English-speaking U.S. society, and parents’ fears that they are losing control over their increasingly Americanized children. Although it is valuable to look at within-household issues, it is also important to consider interactions outside the family structure—particularly between recent immigrant families and earlier immigrants of the same ethnic group, as well as among immigrants and other minority groups residing in the same local communities. Relations between the characteristics and needs of immigrant children and their families and the community structures and public programs that are available to serve them also warrant the attention of researchers and policymakers alike.

Concerns over Cost

Given the sheer numbers of newcomers in America, it is not surprising that immigrants and their effects on U.S. society have garnered significant attention—much of it negative—among the public as a whole, as well as at all levels of government. In fact, concern over immigrants'
place in the United States is running so high that a large number of Americans now support efforts to close the door through which many have entered this country: in a recent poll, 73% of respondents said they supported strictly limiting all immigration.11

Public anxiety over immigrants has risen in part because the recent upsurge in immigration has coincided with a stagnant economy, fueling concerns that people from other countries are displacing U.S. citizen workers, although collected data provide little evidence to support this concern.3 Fear and suspicion surface, too, because many Americans lump together legal and illegal immigrants in their perceptions of the foreign-born population, overlooking the reality that most immigrants, including refugees seeking political asylum, enter America legally, with the express consent of the U.S. government.

The most salient public concerns—and hence policy considerations—center on the costs of providing services to the new immigrants. Immigration policy is made at the federal level, but states and municipalities, increasingly restricted financially, pay the rising costs associated with that policy. Roughly two-thirds to three-fourths of the money that immigrants pay in taxes goes to the federal government, whereas about two-thirds to three-fourths of the expenditures for immigrants are borne at the state and local levels, a fact that drives public perceptions about immigrant costs. Fed up with this imbalance, the governors of states in which large numbers of undocumented immigrants reside have asked Washington to take responsibility for the costs of providing federally mandated services to this population. Four states—Arizona, California, Florida, and Texas—have filed lawsuits against the federal government seeking to recover the spiraling costs of providing services to illegal immigrants and their American-born children. Partly in response to these pressures, the 1994 federal crime bill included $1.8 billion over six years to reimburse states for the costs of detaining criminal illegal immigrants in prisons; Congress approved $130 million for 1995 as the first installment.

Other efforts have sought to limit immigrants’ access to public services, frequently by narrowing the definition of “residents,” as a way to reduce costs; most of these efforts focus on undocumented immigrants. For example, a ballot initiative in California last November, Proposition 187 (dubbed “Save Our State”), sought to bar illegal immigrant children from public schools, exclude illegal immigrants from all but emergency medical care, and require state agencies to report undocumented immigrants to the attorney general (under current federal law, illegal immigrants may attend public school and may receive emergency medical services). The initiative enjoyed wide public support13 and was approved with 59% of the vote, although it was immediately challenged in state and federal courts. Meanwhile, in Florida, the State Department of Health and Rehabilitative Services, which is responsible for caring for abused juveniles, last year began denying foster care to the children of illegal immigrants.14

Opponents of these types of initiatives stress the negative impacts on children of depriving their mothers of prenatal care and children themselves of preventive health care, basic education, and other services, including immunizations. In Virginia, where a law was passed in spring 1994 barring illegal immigrants who are 18 and older from public schools, a number of public school officials said they would rather risk losing state education funds than ask students to prove they are legal residents.15

Previous attempts in the early 1970s by states to restrict the access of undocumented immigrants to federal and state programs, such as Aid to Families with Dependent Children (AFDC), were invalidated by the U.S. Supreme Court. The Court held that the federal government has an overriding interest in matters
affecting immigration and nativity status and rejected the states’ complaints about dwindling resources. Courts have also struck down state and local efforts to discriminate on the basis of nativity in primary and secondary education. Most notably, the Supreme Court’s 1982 ruling in *Plyler v. Doe* reversed Texas’s attempts to bar the undocumented children of illegal immigrants from receiving a free public education. Indeed, the authors of California’s 1994 ballot initiative said they fielded Proposition 187 in part to force the Supreme Court to revisit *Plyler*, which was decided by a five-to-four vote.

Limiting access of legal and illegal immigrants to public benefits has also been debated on Capitol Hill. House Republicans drafted legislation at the end of 1994 which would bar most legal immigrants from 60 federal programs, including childhood immunizations, subsidized school lunches, and AFDC. In spring 1994, a group of moderate House Democrats sought to bar some legal immigrants from eligibility for Social Security, Medicaid, food stamps, and AFDC. The Clinton administration proposed limiting some legal immigrants’ eligibility for food stamps, AFDC, and Supplemental Security Income for five years after arrival.

In September 1994, the U.S. Commission on Immigration Reform recommended in its report to Congress the development of a “clear and consistent policy on immigrant eligibility for public benefits.” Although recommending against any broad, categorical denial of public benefits to legal immigrants, the commission suggested that illegal immigrants should not be eligible for any publicly funded services or assistance, except those made available on an emergency basis or for similar compelling reasons to protect public health and safety or to conform to constitutional requirements. The commission called for a short-term and temporary authorization of “impact aid” to offset part of the costs of unlawful immigration paid by states and localities, contingent on the development of better data and methods to measure the net fiscal impact of illegal immigration. The commission further recommended an immediate authorization of impact aid targeted at the costs of incarcerating illegal immigrants, noting that, although it accepts in principle the need for enhanced federal funding to help localities with the costs of providing education to illegal immigrant children and of emergency medical care under Medicaid to illegal immigrants, available data do not provide reliable estimates of the numbers of illegal immigrant children and the proportion of emergency medical assistance associated with illegal immigrants.

Currently, legal immigrants and refugees may receive benefits such as AFDC, Medicaid, and food stamps, provided they meet the same eligibility requirements as U.S. citizens. For three years after entry, immigrants are also assumed to have available for their support some portion of the income and resources of their immigration sponsors. Children born in the United States to immigrant parents are U.S. citizens and, as such, are eligible to receive federal benefits on the same basis as citizens. The majority (75%) of the children in immigrant households receiving AFDC are U.S.-born. Undocumented immigrants are specifically barred by law from participating in most major federal assistance programs, with one exception: the Omnibus Budget Reconciliation Act of 1986 requires states to provide Medicaid coverage for emergency medical care, including childbirth, to financially and categorically eligible undocumented immigrants. Some undocumented immigrants are also eligible to participate in the Supplemental Food Program for Women, Infants, and Children (WIC).

Efforts to pinpoint just how much immigrants cost the country are difficult, as estimates of net costs have yielded conflicting results. These estimates vary because of disagreements over the number of immigrants, especially the number of undocumented immigrants, and difficulties with measuring the costs of certain services. In addition, there is considerable...
debate over how much immigrants pay in taxes; and the employment and earnings of immigrants—not always easy to measure—figure prominently in calculations of how much assistance they may or may not need. It is also difficult to estimate the indirect costs and benefits associated with immigrants, such as job-creation effects, productivity gains, retention of industry, and increased trade. As expected, cost estimates that include legal immigrants differ greatly from those that attempt to measure the net costs of illegal immigrants alone.

For example, a 1992 study concluded that post-1969 immigrants (legal and illegal) produced a net national deficit of $29.1 billion in public assistance and services. However, a more recent national cost-benefit assessment found that immigrants may actually generate a surplus. According to that study, immigrants who arrived in the United States between 1970 and 1992 paid $70 billion in taxes; subtracting from those taxes the estimated costs incurred by immigrants and their children for health, education, and other services, the study concluded that immigrants during that period generated a surplus of at least $25 billion to $30 billion.

A study that considered the costs of illegal immigrants alone yielded less contested results. Particularly in those seven states in which the majority of undocumented immigrants reside (Arizona, California, Florida, Illinois, New Jersey, New York, and Texas), the negative fiscal impact is considerable: those states spent $3.1 billion to provide public education to the 641,000 undocumented immigrant children enrolled in their public schools in fiscal 1993, $471 million to incarcerate illegal immigrants in state prisons (in 1994 costs), and $441 million in Medicaid costs for illegal immigrants in fiscal 1993. The study also found that $1.9 billion in sales, property, and state income taxes were collected from undocumented immigrants in 1992, leaving a net loss of $1.2 billion.

With respect to the economic well-being of immigrants, the distinction between legal and illegal immigrants assumes paramount importance. The average household incomes of both legal immigrants and refugees who entered before 1980 are higher than those of U.S.-born Americans. According to the Census Bureau, the education and income level of recent legal immigrants remained high through the 1980s, despite public perceptions to the contrary. However, the economic status of the illegal immigrant population is so poor that, when the immigrant population as a whole is examined, it is found to be less well off than the U.S.-born population on virtually all measures of socioeconomic status, such as household poverty, despite the relatively low numbers of undocumented immigrants.

Policy Issues Today

Today’s unprecedented influx of immigrants from a wide array of nations demands that policymakers address issues related to these populations in the near term. Two policy matters at the forefront of current discussions are education and health care.

Education

In school districts across the country, the very face of schooling is changing as the arrival of foreign-born and second-generation immigrant children challenges educators and policymakers to adapt to a changing population, one that is highly diverse culturally, racially, and linguistically. The prevailing impression is that immigrant children, regardless of their country of origin, do not adjust well to school and perform poorly academically, draining resources from an already overburdened educational system. However, assumptions that treat immigrant children as a homogeneous group are far from accurate; immigrant children’s educational needs and outcomes differ considerably depending on their socioeconomic status, levels of English proficiency, cultural background, and experiences in their country of origin. Many of these sources of diversity affect
Immigrant children and their families: issues for research and policy

Educational outcomes, leading to highly variable results across and within immigrant groups. Chief among the sources of diversity are social class and language. It is also critical to consider how school districts vary in their response to the varying needs of immigrant children because of its effect on achievement patterns.

The educational outcomes of immigrant children cannot be understood without considering the range of social and economic backgrounds that characterize these children and their families. In the United States, research on these issues often fails to disentangle the influences of social class and immigrant status. This problem is further compounded by patterns of selective migration, in which differing immigrant groups may over- or underrepresent the more (or less) educated populations of their countries of origin. This makes it exceedingly difficult to interpret or generalize from studies of specific immigrant subpopulations in specific, local communities.

There is mounting evidence that immigrant youths perform at least as well academically and may stay in school longer than their U.S.-born majority-group peers of similar class backgrounds.7 Indeed, in spite of often difficult circumstances, such as those experienced by refugee children who come to the United States from war-torn nations, some immigrant children even exceed the academic norms of U.S.-born native English speakers from advantaged environments.3,28

But other immigrant students perform less well, fueling public stereotypes about specific immigrant groups. Aggregate national statistics, particularly those that document lower achievement levels for Hispanic immigrant students,3 camouflage the wide variation in educational outcomes that characterizes both first-generation Hispanics and their second- and third-generation counterparts. In addition to social class, the fact that immigrant children are disproportionately represented among students with limited English proficiency (LEP) greatly affects their school achievement.

Turning to immigrant students with limited proficiency in English, unresolved issues for policy, practice, and research abound. Indeed, it is difficult even to obtain reliable data on the school success of these children for several reasons: the paucity of adequate assessment instruments for LEP immigrant children, policies that exclude these children from assessments for fear that overall averages of school success will suffer, and lack of outcome data that identify students by LEP or immigrant status.

Estimates of students with limited English proficiency range from 2.3 million10 to as high as 3.3 million.29 The Census Bureau further estimates that 1.8 million school-age children live in households in which no one age 14 or older speaks English “very well.”9 Although these figures are not restricted to immigrant children, this population has contributed significantly to recent increases in the number of students with limited English proficiency. The current influx of new immigrant groups means continuing increases in the number of students who enter American schools with little or no English proficiency.30

Immigrant youths perform at least as well academically and may stay in school longer than their U.S.-born majority-group peers of similar class backgrounds.

Immigrant children with limited English proficiency are eligible to participate in school programs funded by the Bilingual Education Act (Title VII of the Elementary and Secondary Education Act [ESEA]) or the Emergency Immigrant Education Act of 1984 (Title IV, Part D, of ESEA), which authorizes the Emergency Immigrant Education program. They may take part in English as a second language (ESL) or limited English proficiency (LEP) programs.31

Federal expenditures for bilingual education, adjusted for inflation, declined 48% during the 1980s, despite a 50% increase in the size of the LEP population; Title VII spending on bilingual education remains quite low, at just slightly more
than $200 million annually.\textsuperscript{4,23} In contrast, appropriations for immigrant education, which fell over the course of the 1980s, have recently increased considerably; the appropriation for Fiscal Year 1995 was $50 million, the request for Fiscal Year 1996, $100 million.\textsuperscript{32}

Title I (formerly Chapter 1), the federal grant program designed to address the educational needs of economically disadvantaged children, could serve low-income immigrant children, but it has failed to do so in a systematic way, according to two 1993 assessments.\textsuperscript{4,29} The exclusion from Title I educational services of immigrant children, notably those with limited English proficiency, has been attributed to multiple factors, including funding allocation formulas that adversely affect districts with high numbers of immigrant students, use of English-only placement tests, and ambiguous language regarding eligibility in the legislation authorizing the program. As a result, there has been great variation by state and school district in the proportion of LEP children served by Title I; in fact, 12 of 31 state education agencies surveyed in one study said no program services at all were provided to Title I-eligible LEP students.\textsuperscript{4} Recent changes in Title I may, however, begin to rectify the highly uneven attention to immigrant students in the program. These changes, approved by Congress in 1994, include allowing future funding increases to be targeted to high-poverty school districts, expanding school-wide programs that would enable all students in school to be served, and clarifying the language regarding eligibility of LEP students.

To the extent that the focus of attention is on immigrant students with limited English proficiency, states, especially those with large numbers of LEP students, have policies and programs that offer special language assistance, due in large part to the Civil Rights Act and other federal and state laws.

The pressing practical issue, then, is not whether policies and programs for immigrant students exist, but to what extent appropriate policies for immigrant children and existing policies (such as those for LEP students) overlap, and whether special policies and programs are needed for immigrant children. Among the crucial questions: Are there social services that schools might provide or coordinate which would benefit recent arrivals? Do immigrant students need educational services different from those provided to LEP students? What might those services be and how should they be integrated into the educational system?

Debates over the education of immigrant children are not, however, restricted to issues associated with language. One of the most salient public concerns is the cost of educating immigrant children. In fact, education is one of the largest expenditures associated with immigrants,\textsuperscript{33} the major share of costs being borne by states and localities.\textsuperscript{7} A recent report on the costs of providing welfare and education to immigrants found that 5.2\%, or $11.8 billion, of total 1992 federal and state expenditures for public education, Title VII bilingual education, and the National School Lunch program went to immigrants and programs that serve them.\textsuperscript{34} Public concerns mount when, amid financially stretched local budgets, already oversubscribed tax dollars are spent on programs for immigrant children, fueling divisive efforts to restrict immigrants’ access to public services.

Additional policy issues posing challenges to educators today include training teachers to address the special needs of immigrant children, developing instructional materials for immigrant children, ensuring that there are assessment instruments in languages other than English and Spanish, and determining what investments the public is willing to make in helping ensure the education (and future economic success) of immigrant children. In addition, some educators are developing policies that focus on addressing immigrant children’s special needs within the context of current education.
reform efforts emphasizing systemic initiatives to improve educational outcomes for all children.

**Physical and Mental Health**

Immigrants’ health status is of great interest to policymakers as the number of immigrants in the United States increases. The immigrant population’s access to health care services is also a crucial issue insofar as it affects physical and mental well-being, as well as the ability of immigrants to adapt and contribute to life in the United States.

For many immigrants, especially children, the immigration process itself is an event of extraordinary intensity and stress in which individuals are torn by conflicting social and cultural demands while trying to adapt to an unfamiliar and sometimes hostile environment, which may well be discriminatory. Although it is not uncommon for immigrants to experience an initial euphoria upon arrival in the United States, that phase is often followed by depression, which can last well into the third year after arrival.\(^{35}\) Undocumented immigrants and their U.S.-born children face the added stress associated with the fear of deportation and separation from family members.

For some immigrants, health worsens over time in the United States. In a recent study that aggregated data across all immigrant groups, researchers found that, on virtually every measure of health status, immigrants who had lived in the United States 5 years or less were healthier than foreign-born persons who had lived in the United States 10 years or more.\(^{36}\) These intriguing findings lend themselves to multiple interpretations. Immigrants may arrive with existing physical conditions that are masked during the initial settling-in period, or they may acquire those conditions or certain behaviors (such as smoking, drinking, and lifestyle changes) that put them at risk in their new environment. Alternatively, health may deteriorate with increased duration of residence in the United States as a result of limited access to appropriate health care. Finally, because health status is so highly correlated with family income, if income declines with increased length of residency, the health results may derive primarily from socioeconomic factors.

Smaller studies, primarily among Mexican Americans, of both generational effects and length of residence have confirmed associations between these variables and health outcomes. For example, rates of lifetime depression and alcohol and drug abuse were higher for U.S.-born persons of Mexican descent than for immigrants to the United States who were
born in Mexico, according to one study. Negative pregnancy outcomes—including rates of difficult pregnancies, low birth weight babies, and infant mortality—have also been found to increase among Hispanic immigrants with subsequent generations in the United States.\textsuperscript{37,38}

In contrast, a separate study of Indochinese immigrants in San Diego County who appeared to be at risk for poor infant health outcomes (with high levels of unemployment, poverty, welfare dependency, and depressive symptomatology) were found to have much lower infant mortality rates than the San Diego County average. The results were explained by a nearly universal absence of tobacco, alcohol, and drug abuse among pregnant Indochinese women so that, even with late onset of prenatal care, they had very positive pregnancy outcomes.\textsuperscript{39}

These data point to the importance of identifying conditions under which immigrant groups fare well and those that produce negative health outcomes. Among factors to consider are family networks and social supports, relationships within families, the effect of frequent mobility on children’s lives, segmented assimilation into different kinds of contexts, and cultural practices from the country of origin. It is also important to consider the effects of lack of health insurance and inconsistencies in health care.

Immigrant children and their families tend to receive a patchwork of health care services. Eligibility depends on their immigrant status.

For some refugees, eligibility for health care services has been reduced in recent years; whereas needy refugees who were ineligible for Medicaid used to be able to receive refugee medical assistance (which provides benefits similar to those provided by Medicaid) for 36 months after arrival, beginning in 1982 and continuing to 1991, those benefits were cut to 8 months.\textsuperscript{41} This reduction in services can be difficult for newcomers, particularly those with chronic health conditions and those for whom health problems surface after a period of settlement in the United States.\textsuperscript{40}

As with education, concerns over the costs of providing these medical services to immigrants (especially to undocumented immigrants) have spurred efforts to restrict this population’s access to health care. One of the authors of California’s Proposition 187 put the cost of providing comprehensive health services to California’s illegal immigrants in 1992 at $900 million, an increase of 1,800% over the previous five years.\textsuperscript{18} (This figure is considerably higher than current costs of providing a limited range of public health treatments and screenings; it is also higher than findings reported for illegal immigrants’ Medicaid costs in the 1994 study of the fiscal impacts of illegal immigrants in seven states.\textsuperscript{27}) Opponents of efforts to limit services to immigrants counter that denying
children access to preventive health care and immunizations is foolhardy public policy, destined to haunt society in later spiraling costs for emergency medical services (for which immigrants are eligible).42

The needs identified in the literature on immigrant health suggest the importance of crafting health care systems that are culturally sensitive to immigrants’ needs. Many American health care providers need to better understand traditional health care beliefs and practices often utilized by immigrants (especially recent newcomers) to provide culturally relevant and effective services. Failure to do so can result in an erosion of those strategies within the immigrant family and, frequently, a lack of new strategies with which to address illness.43

**Issues for Research**

Existing research on immigrant children is extremely sparse, especially for young children. There are, however, several national and smaller data sets that include information on immigrant status and could be mined fruitfully by researchers interested in examining the characteristics and development of immigrant children and families. One of them is the Public Use Microdata Sample from the 1990 census.44,45 Smaller empirical studies of immigrant children and families are also being launched by a growing number of investigators.46–49 However, the current public climate that supports limiting immigrants’ use of public services may create disincentives for immigrants to enter into situations in which they are identified as such, including participating in research that identifies subjects by their immigrant status.

Despite the paucity of research on immigrant children and families, state and local policymakers are developing programs for immigrants now. It is therefore crucial that researchers and others with a full understanding of the complex issues surrounding these vulnerable populations inform the development of such programs. Research on immigrant children and families can throw light on the issues affecting these populations, removing them from obscurity and validating their experiences. In addition, as the composition of America changes, it is crucial that ongoing research reflect these changes; excluding immigrant children from research will render existing studies of so-called mainstream populations increasingly unrepresentative.

Furthermore, research has a role to play in crafting effective responses to the needs of America’s changing population mix. The absence of reliable research on immigrant children and families heightens the risk that policies and programs for newcomer children will be dismissive rather than inclusive and effective. Indeed, failure to meet the needs of immigrant children and their families—from health care to education, skills training, and language acquisition—jeopardizes not only their personal development but also their future success as labor force participants and fruitful contributors to American society.

Many research areas require more attention. Researchers who have studied the adaptation of immigrant children to life in the United States surmise that their assimilation is based on a variety of factors, many of them involving the central role of the family,46–48 including family structure and attitudes, immigration status (legal, illegal, refugee), the child’s age upon entry to the United States, conditions under which the child lived before coming to the United States, the type of community in which the child currently lives, the family’s financial status and prospects, and whether the child was born in the United States or in the family’s country of origin. Generational trends, by which some outcomes improve and others deteriorate across first-, second-, and third-generation immigrant cohorts, are now emerging in the research literature and constitute a particularly promising avenue for deciphering risk and protective factors that affect immigrant children.
Also important are what country the family came from, skin color and race, gender, available support systems in and outside the United States, and geographic location and mobility patterns within the United States, including the effects of circular migration—travel to and from the country of origin—on schooling and health.

Despite this exhaustive list, much is not understood about children’s adaptation: Why do some immigrant children succeed in school and others fail? Why do some impoverished immigrant groups show strikingly low rates of infant mortality compared with U.S.-born groups with similar background characteristics? Under what conditions and for whom do development and schooling outcomes deteriorate over time, for whom do they improve, and why? What role does self-selection play among immigrants and how do the personal characteristics that immigrant children and families bring with them help or hinder their adjustment to life in the United States? How do the economic or political factors motivating parents’ immigration, and their status as legal or illegal immigrants, affect the developmental challenges and adaptation strategies of children?

Studies that address the prevention of psychological maladjustment and educational failure may be useful, as well as a search for those variables that mediate or moderate the impact of the stresses of immigration and settlement and that predict successful adjustment and optimal development. Which forms of experience associated with immigration and settlement are likely to influence the course of adaptation, adjustment, and development of immigrant children? What enables a child to reach his or her full potential? What factors can prevent the downward trend experienced by, and often even expected of, so many immigrant children?

Developmental approaches to the study of immigration are also important, including perspectives that consider the life changes of immigration and settlement in view of their timing in relation to events such as school entry and the onset of puberty.

As noted above, for some immigrant groups, measures of health, educational attainment, and economic well-being deteriorate the longer they are in the United States; for others, those indicators improve. In this field, studies are needed which account for the patterns and behaviors exhibited by first-, second-, and later-generation immigrants. Researchers could focus on how outcomes are affected by country-of-origin beliefs, tensions between family customs and new American ways, and the immigration experience itself.

Studies could also explore the protective role of cross-generational attachments and bonding among immigrant populations, as well as factors that lead to different kinds of adjustment patterns within immigrant families. In addition, researchers could include in their work investigations of the development of illegal immigrant children who do not take part in schooling or fail to receive health care due to parents’ concerns about being found to be in the United States illegally.

Research is also needed on non-migrants so that the knowledge base comprises information not only on how immigrants adapt to their new environment, but also on how the arrival of immigrant children affects U.S.-born children as well as the larger community.

America in the future will be more racially, ethnically, and culturally diverse than ever before, largely as the result of recent immigration patterns. The general consensus at the workshop was that immigrant children, far from being a fringe element of America’s population, are a large and increasing core part of our communities, our schools, and our society. As the composition of our country changes, it will be up to our institutions to adapt to these enormous shifts.
1. The project that is the subject of this report was approved by the governing board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

This report has been reviewed by a group other than the authors according to procedures approved by a report review committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

The National Academy of Sciences is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by the Congress in 1863, the academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Bruce Alberts is president of the National Academy of Sciences.

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The Institute of Medicine was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, upon its own initiative, to identify issues of medical care, research, and education. Dr. Kenneth I. Shine is president of the Institute of Medicine.

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2. Members of the Board on Children and Families include the following: Sheldon H. White (chair), Department of Psychology, Harvard University; Jack P. Shonkoff (vice chair), Heller Graduate School, Brandeis University; Jomills H. Braddock, II, Department of Sociology, University of Miami; David V.B. Britt, Children’s Television Workshop, New York City; Larry Bumpass, Center for Demography and Ecology, University of Wisconsin; Peggy Davis, Clinical Law Center, New York University; Fernando A. Guerra, San Antonio Metropolitan Health District; Bernard Guyer, Department of Maternal and Child Health, Johns Hopkins University; Aletha C. Huston, Human Development and Family Life, University of Kansas; Ray Marshall, LBJ School of Public Affairs, University of Texas; Robert Michael, Harris Graduate School of Public Policy Studies, University of Chicago; Paul Newacheck, Institute of Health Policy Studies and Department of Pediatrics, University of California, San Francisco; Julius B. Richmond, Department of Social Medicine, Harvard University Medical School; Timothy M. Sandos, City Council, Denver, Colorado; Lisbeth B. Schorr, Harvard Project on Effective Services, Harvard University; Carole Simpson, ABC News, Washington,
DC; Deborah Stipek, Graduate School of Education, University of California, Los Angeles; Diana Taylor, Women’s Health Program, Department of Family Health Care Nursing, University of California, San Francisco; and Gail Wilensky, Project Hope, Bethesda, Maryland. The following individuals are liaisons: Joel J. Alpert, Institute of Medicine Council; Ann L. Brown, Commission on Behavioral and Social Science and Education; and Ruth T. Gross, Board on Health Promotion and Disease Prevention, Institute of Medicine. The following individuals staff the Board: Deborah A. Phillips (director), Anne Bridgman (program officer for communications), Sahr J. Kpundeh (program officer), and Drusilla Barnes (administrative associate).


5. The workshop, titled the Invisible Immigrant Population: Young Children and Their Families in the United States, was held on September 8–9, 1994. Workshop participants were Christine Bachrach, Demographic and Behavioral Sciences Branch, Center for Population Research, National Institute of Child Health and Human Development; Frank D. Bean, Population Research Center, University of Texas at Austin; Rodney R. Cocking, Basic Behavior and Cognitive Sciences Research Branch, National Institute of Mental Health; Glen H. Elder, Jr., Carolina Population Center, University of North Carolina; David Featherman, Social Science Research Council; Michael Fix, Urban Institute; Linda Gordon, Statistics Division, Immigration and Naturalization Service; David Howell, U.S. Commission on Immigration Reform; Guillermina Jasso, Department of Sociology, New York University; Frank Kessel, Social Science Research Council; Nancy Landale, Population Research Institute, Pennsylvania State University; Rose Li, Demographic and Behavioral Sciences Branch, Center for Population Research, National Institute of Child Health and Human Development; Lindsay Lowell, Immigration Policy and Research, U.S. Department of Labor; Susan Martin, U.S. Commission on Immigration Reform (dinner speaker); John Mollenkopf, Public Policy Program, City University of New York; Jeylan Mortimer, Life Course Center, University of Minnesota; Katherine Newman, Department of Anthropology, Columbia University; Laurie Olsen, California Tomorrow; Mark Rosenzweig, Department of Economics, University of Pennsylvania; Ruben G. Rumbaut, Department of Sociology, Michigan State University; Patricia Shiono, Director of Research and Grants, Epidemiology, Center for the Future of Children, The David and Lucile Packard Foundation; Mary Lou de Leon Siantz, Department of Psychiatric/Mental Health Nursing, Indiana University School of Nursing; Betty Lee Sung, Department of Asian Studies, City College of New York; Eric Wanner, Russell Sage Foundation; Sheldon H. White, Department of Psychology, Harvard University.


12. Frank D. Bean, Population Research Center, University of Texas at Austin. Workshop discussion.


35. Ruben G. Rumbaut, Department of Sociology, Michigan State University. Workshop discussion.


37. Guillermina Jasso, Department of Sociology, New York University. Workshop discussion.

38. Mary Lou de Leon Siantz, Department of Psychiatric/Mental Health Nursing, Indiana University School of Nursing. Workshop discussion.


43. Laurie Olsen, California Tomorrow. Workshop discussion.


Outcomes for Youths with Serious Emotional Disturbance in Secondary School and Early Adulthood

Mary M. Wagner

Abstract

Data from the National Longitudinal Transition Study of Special Education Students are used to describe the high school performance, social experiences, postsecondary education and labor market participation, and residential independence of students with serious emotional disturbance (SED) nationally. Young people with SED are found to fare poorly compared with youths with disabilities as a whole and with youths in the general population. The high school programs and adult services provided to young people with SED are then analyzed in a search for clues to contributors to the poor pattern of outcomes for such youths and to opportunities to improve those outcomes in the future.

A desire to improve outcomes for children and families is driving much of the current effort to reform systems of education and human services in this country. Focusing on outcomes entails shifting the justification for programs from the activities they sponsor to the improvements they achieve in the lives of the children and families they serve. In the educational context, the consensus that has emerged over the past decade regarding the importance of attending to outcomes is perhaps most clearly embodied in the national education goals, established in September 1989 by then President Bush and the nation’s governors and more recently codified in Goals 2000: Educate America Act (Public Law 103-227). By addressing issues such as increasing graduation rates and achieving world-class standards in core subject areas, the national education goals focus attention on the contribution of positive student outcomes to our nation’s future well-being.1
The need for a comprehensive look at outcomes also has been recognized for students with disabilities, who are 11% of the students in this country, but who have routinely been excluded from ongoing assessments of education and other outcomes. In 1975, Public Law 94-142 required that students with disabilities be given an individualized, appropriate, free public education in the least restrictive environment possible. In the ensuing decade, much attention was paid to procedural compliance with those requirements. However, the limitations of focusing only on issues of access were revealed by outcome studies in several states, which reported that students with disabilities were receiving special education and related services but many were not finishing high school and were achieving only limited success as young adults. But these state studies were an insufficient basis on which to make federal policy to improve outcomes for students with disabilities; national data were needed to make national policy.

To fill this need for information, Congress directed the Secretary of Education to conduct a longitudinal study of “the educational progress of students with disabilities while in special education” and “the occupational, educational, and independent living status of students with disabilities after graduating from secondary school or otherwise leaving special education” [U.S.C. sec. 1418(3)(2(A)]. In 1985, under contract to the Office of Special Education Programs (OSEP) of the U.S. Department of Education, SRI International began to develop the design, sample, and data collection instruments for the National Longitudinal Transition Study of Special Education Students (NLTS). SRI initiated the study in 1987 and completed it in 1994.

The NLTS has compiled a longitudinal database that includes more than 8,000 young people with disabilities who were ages 13 to 21 and special education students in the 1985–86 school year in more than 300 school districts nationwide. This database is a nationally representative sample that permits generalizations from it to young people with disabilities as a whole and to those in each federal special education disability category. Data were collected from telephone interviews with parents and with young people with disabilities when they were able to respond to questions for themselves. School records were obtained for students’ high school years, and surveys were conducted of principals at their schools and of teachers who served them.

The numerous reports that have been generated from the NLTS since 1989 have considered issues of school programs, school performance, postschool outcomes, and adult services. Each analysis topic that has been
addressed has added another dimension to the complex pattern of outcomes for students with disabilities.

As the NLTS staff pursued its lengthy analysis agenda, one theme was consistently reinforced. There is no single story to tell about outcomes for students with disabilities; young people with different kinds of disabilities differed more from one another than they did from the general population of youths, and the outcomes they were able to achieve reflected those sizable differences. Some youths, such as those with sensory impairments, attended postsecondary schools at virtually the same rate as youths in the general population, but fared less well in the labor market. In contrast, youths with learning disabilities were as likely to be employed in their early years after high school as the general population of young people of similar ages, but rarely furthered their education or training after high school. Some youths with severe or multiple disabilities struggled to perform basic self-care and independent living tasks that were taken for granted by the majority of their peers.

Throughout our work, the outcomes for young people with serious emotional disturbances (SED) have been particularly troubling. Described by some as “mad, bad, sad, and can’t add,” many of these young people have had a particularly difficult time finding success in school and in adult life. The individual and social costs of their failure to achieve positive outcomes in school and beyond are quite high, underscoring the importance of improving public policy and programming for children and adolescents with serious emotional disturbances. Efforts to do so have been increasing in recent years, resulting recently in a National Agenda for Achieving Better Results for Children and Youth with Serious Emotional Disturbance.

This article uses data from the NLTS to spotlight the outcomes for students with SED, both while they were in secondary school and in the early years afterward. Their performance as high school students, their social experiences, their participation in postsecondary education and the labor market, and their ability to live independently are described. The high school programs and adult services provided to young people with SED are then analyzed in a search for clues to contributors to the poor pattern of outcomes for such youths and to opportunities to improve those outcomes in the future.

Characteristics of Students with SED

What Is SED?

Understanding the characteristics of students with SED is important in interpreting the outcomes they achieve. SED is one of 11 categories of disability specified in the federal special education law that pertained at the time of the NLTS. These categories and their definitions are presented in Box 1. The distribution among these categories of secondary-school-age students (generally ages 13 to 21) in special education is depicted in Figure 1.
### Federal Definitions of Special Education Disability Categories

**specific learning disability:** a disorder in one or more of the basic psychological processes involved in understanding or using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, write, spell, or to do mathematical calculations. This category includes perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia, but does not include learning problems resulting from visual, hearing, or motor handicaps, or from mental retardation.

**seriously emotionally disturbed:** exhibiting behavior disorders over a long period of time which adversely affect educational performance. These include an inability to learn that cannot be explained by intellectual, sensory, or health factors; an inability to build or maintain satisfactory interpersonal relationships with peers and teachers; inappropriate types of behaviors or feelings under normal circumstances; a general pervasive mood of unhappiness or depression; and/or a tendency to develop physical symptoms or fears associated with personal or school problems.

**speech impaired:** exhibiting communication disorders, such as stuttering, impaired articulation, and/or language or voice impairments, that adversely affect educational performance.

**mentally retarded:** characterized by significantly subaverage general intellectual functioning with concurrent deficits in adaptive behavior which were manifested in the developmental period and adversely affect educational performance.

**visually impaired:** having a visual impairment that, even with correction, adversely affects educational performance. This category includes students who are partly sighted and those who are completely blind.

**hard of hearing:** having a hearing impairment, permanent or fluctuating, that adversely affects educational performance but is not included in the deaf category.

**deaf:** having a hearing impairment so severe that it interferes with the processing of linguistic information through hearing, with or without amplification, and therefore adversely affects educational performance.

**orthopedically impaired:** having a severe orthopedic impairment that adversely affects educational performance, including impairments caused by congenital anomaly, disease, or other causes.

**other health impaired:** having limited strength, vitality, or alertness, as a result of chronic or acute health problems, that adversely affects educational performance. This category includes autistic students.

**multiply handicapped:** exhibiting concomitant impairments, the combination of which causes such severe educational problems that students possessing them cannot be accommodated in special education programs solely for one of the impairments. This category does not include students who are deaf/blind.

**deaf/blind:** exhibiting concomitant hearing and visual impairments, the combination of which causes such severe communication and other developmental and educational problems that students possessing them cannot be accommodated in special education programs solely for deaf or blind students.

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SED, externalizing behaviors (that is, conduct disorders, “acting out” behaviors) are significantly more prevalent than internalizing behaviors (that is, withdrawal, depression).¹⁷

The federal definition also suggests why students who qualify as having SED for special education purposes are only a subset of children who have mental illnesses. To qualify for special education, not only must a child have an emotional disturbance or behavioral disorder, but also the disorder must (1) be exhibited over a long period of time, (2) be considered “severe” by those evaluating it, and (3) adversely affect the student’s educational performance. Thus, although epidemiological studies suggest that 8% to 12% of all children and adolescents have emotional disturbances that could benefit from intervention,¹⁸ students who are identified as having the prolonged, severe, and educationally debilitating disorders that qualify them to receive special education are fewer than 1% of school-age children.

In the 1991–92 school year, there were 400,670 students ages 6 through 21 who fit the federal definition of serious emotional disturbance and were served in special education programs in this country.¹⁹ This constitutes a 46% increase in students with this classification since 1976, when states began reporting the number of students served in special education. This rate of growth outpaces the increase in the number of special education students as a whole (35%) over the same time period.

The majority of students with SED (64%) were reported by parents as “beginning to have trouble with their disabilities” in their grade school years.²⁰ However, 16% reportedly did not begin to exhibit emotional problems that were considered troublesome until their secondary school years. In fact, NLTS findings show that students with SED were more likely than students with any other disability first to experience disability-related problems in adolescence. This relatively late onset of SED, confirmed in other research,²¹ has at least two plausible explanations. It is possible that the actual behaviors that resulted in identification of students as having SED were present earlier but were not considered troublesome when exhibited by younger children. In fact, some argue that

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**Figure 1**

**Primary Disability Categories of Secondary Special Education Students Reported by the NLTS**

<table>
<thead>
<tr>
<th>Disability Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mentally Retarded</td>
<td>23.9%</td>
</tr>
<tr>
<td>Orthopedically Impaired</td>
<td>1.2%</td>
</tr>
<tr>
<td>Visually Impaired</td>
<td>0.7%</td>
</tr>
<tr>
<td>Emotionally Disturbed</td>
<td>10.5%</td>
</tr>
<tr>
<td>Deaf</td>
<td>0.8%</td>
</tr>
<tr>
<td>Hard of Hearing</td>
<td>0.9%</td>
</tr>
<tr>
<td>Learning Disabled</td>
<td>55.6%</td>
</tr>
<tr>
<td>Multiply Handicapped</td>
<td>1.6%</td>
</tr>
<tr>
<td>Deaf/Blind</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

NLTS source: Interviews with parents.
indicators of emotional and behavioral disorders often are present but unrecognized in younger children and that early intervention has the potential to reduce the severity of disability among students with SED later in their school careers. An alternative explanation for the relatively late onset of SED is that physiological changes associated with adolescence may trigger or compound emotional or behavioral disorders. Unfortunately, diagnoses of the causes of or contributors to SED in children and adolescents often are unclear.

**Identifying Students with SED**

Generally, students who exhibit behaviors that suggest the possibility of an emotional disturbance are referred by a teacher or other school staff to a student assessment process that is under the auspices of special education. The purposes of assessment are (1) to evaluate the specific abilities and disabilities of the child to determine whether he or she qualifies for special education and related services, and (2) to provide recommendations regarding which services seem most appropriate given the child’s identified special needs. (The content and nature of education and related services for students with particular disabilities are not specified in law, but are to be determined individually on the basis of the child’s unique needs.)

In the assessment process, generally a written rationale for the child’s referral is compiled, along with background information, such as health and family history, and summaries of any known earlier assessments. Assessments are performed which often involve cognitive tests (for example, the Wechsler IQ series), affective tests (for example, the Walker and McConnell Scale of Social Competence and School Adjustment), academic tests (for example, the Woodcock-Johnson Psycho-Educational Battery), and psychological evaluations that usually are completed by a school psychologist. However, poor assessment tools and procedures have resulted in dissatisfaction with the process and debate about whether too many, too few, or the wrong students are identified as having SED.

**Demographic Characteristics of Students with SED**

Demographic characteristics of students who are identified as having SED and who receive special education have caused critics to raise questions regarding the equity or fairness of the identification and assessment process. When findings from the NLTS are compared with national samples, it is apparent that students with disabilities in general and those with SED in particular were significantly more likely than students as a whole to be male, African American, and to experience a constellation of factors associated with economic disadvantage (see Table 1). For example, one-fourth of high school students with SED were African American, even though African-American students constituted only 14% of the general population of students of similar age. Some contend that this overrepresentation of African-American students among those with “discretionary disabilities,” such as SED and learning disabilities, results from schools’ intolerance for behaviors more characteristic of the African-American culture than mainstream white society. However, similar proportions of African-American students were found among those who were deaf (24%), visually impaired, or physically disabled (25%).

Poor assessment tools and procedures have resulted in dissatisfaction with the process and debate about whether too many, too few, or the wrong students are identified as having SED.
Table 1

Demographic Characteristics of Youths with SED, Youths with Any Disability, and Youths in the General Population

<table>
<thead>
<tr>
<th></th>
<th>Youths With SED</th>
<th>Youths With Any Disability</th>
<th>In the General Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage male</td>
<td>76.4</td>
<td>68.5</td>
<td>51.4&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Percentage who were</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>67.1</td>
<td>65.0</td>
<td>73.0&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>African American</td>
<td>25.1</td>
<td>24.2</td>
<td>14.0</td>
</tr>
<tr>
<td>Hispanic</td>
<td>6.0</td>
<td>8.1</td>
<td>6.2</td>
</tr>
<tr>
<td>Other</td>
<td>1.7</td>
<td>2.7</td>
<td>6.9</td>
</tr>
<tr>
<td>Percentage from household with</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1986 annual income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under $12,000</td>
<td>38.2</td>
<td>34.8</td>
<td>18.2&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>$12,000 to $24,999</td>
<td>32.1</td>
<td>33.5</td>
<td>20.6</td>
</tr>
<tr>
<td>$25,000 to $37,000</td>
<td>15.7</td>
<td>16.2</td>
<td>25.4</td>
</tr>
<tr>
<td>$38,000 or more</td>
<td>14.0</td>
<td>15.4</td>
<td>35.8</td>
</tr>
<tr>
<td>Percentage with head of household</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>whose highest education was</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some high school</td>
<td>43.7</td>
<td>41.0</td>
<td>22.3&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>High school graduate</td>
<td>29.1</td>
<td>36.0</td>
<td>38.8</td>
</tr>
<tr>
<td>Some college/two-year degree</td>
<td>18.0</td>
<td>14.0</td>
<td>17.8</td>
</tr>
<tr>
<td>Four-year degree or more</td>
<td>9.2</td>
<td>8.9</td>
<td>21.1</td>
</tr>
<tr>
<td>Percentage from single-parent</td>
<td>44.3</td>
<td>36.8</td>
<td>25.6&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>household</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage whose community was</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>39.5</td>
<td>29.6</td>
<td>22.3&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Suburban</td>
<td>34.0</td>
<td>33.6</td>
<td>47.9</td>
</tr>
<tr>
<td>Rural</td>
<td>26.5</td>
<td>36.8</td>
<td>28.7</td>
</tr>
</tbody>
</table>

n = 552 to 777, 6,092 to 7,142

<sup>a</sup> National Longitudinal Survey of Youth (U.S. Department of Labor, 1979 to 1983, unpublished). Data are for youths ages 15 to 20 who were in secondary school or had been in secondary school in the current or previous school year(s).

<sup>b</sup> U.S. Bureau of the Census (1988). Data refer to youths ages 12 to 17 and living with at least one parent in March 1987. Note that categorical boundaries are $12,500, $25,000, and $40,000 rather than the $12,000, $25,000, and $38,000 used in the NLTS.


NLTS source: Interviews with parents.
impaired (26%), or orthopedically impaired (19%), categories for which staff discretion in identifying students as having disabilities was minimal. This fact suggests that poverty—rather than school policy or practice—may be the reason African-American students appear disproportionately in all categories of disability.

Table 1 demonstrates that poverty was pervasive among students with SED. In 1987, more than one-third of students with SED came from households with an annual income of less than $12,000; only 18% of students in the general population did so. Forty-four percent of students with SED came from single-parent households, compared with about one-fourth of the general population of students. Other studies indicate that family stressors were common, as was child abuse (not shown in Table 1). “It is becoming clear that the more high-risk factors in a child’s life, the greater the likelihood that emotional and behavioral disorders will result.”

This picture of emotional disturbance, significant economic disadvantage, and notable family stressors is the backdrop against which to view the outcomes for students with SED in secondary school and beyond.

**Secondary School Outcomes for Students with SED**

High school students with SED demonstrated a pattern of disconnectedness from school. Among youths in the various disability categories, those with SED were some of the least likely to belong to clubs or social groups at school (see Table 2). Preferring to center their social lives outside school, high school students with SED were more likely than students with any disabilities to be reported by parents as seeing friends outside school very frequently (six or more days a week). High absenteeism further suggests disengagement from school. Students with SED missed an average of 18 to 20 days of school each year in high school, the highest rate of absenteeism of any category of students with disabilities at most grade levels.

The NLTS has shown absenteeism and poor social integration to be among the most powerful predictors of poor school performance for students with disabilities. At all grade levels, the grade point averages (GPAs) of students with SED were below those of other students with disabilities, which, in turn, were below those of students in the general population. More than three-fourths of students with SED had failed one or more courses, the highest failure rate of any category of students with disabilities.

The poorer grades earned by students with SED relative to other students with disabilities were not entirely a reflection of poorer scholastic aptitude. Table 3 shows that the reading and mathematics abilities of students with SED (as measured by standardized tests) were, on average, not as far behind their actual grade levels as the abilities of most other categories of students. For example, students with SED were, on average, 2.2 grade levels behind in reading and 1.8 grade levels behind in mathematics, compared with hearing or orthopedically impaired students, who were 3 or 4 grade levels behind in those abilities. Yet students with SED had grade point averages of 1.7 in 9th and 10th grades, compared with 2.3 for hearing impaired students and 2.4 for those with orthopedic impairments.

Grade performance generally was poorer for students with SED, as well as several other categories of students, in their regular education than in their special education courses. The GPA for students with SED in regular education classes was 0.2 points lower than in their special education classes at each grade level. Further, over four years, 74% of students with SED who took any regular education classes failed one or more of them, compared with 23% of students with SED who took special education classes and failed at least one of them.
Table 2

Secondary School Performance of Students with SED, Students with Any Disability, and the General Population of Students

<table>
<thead>
<tr>
<th></th>
<th>Secondary School Students</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With SED</td>
<td>With Any Disability</td>
<td>In the General Population</td>
<td></td>
</tr>
<tr>
<td>Percentage who belonged to a school or community group</td>
<td>37.3</td>
<td>42.6</td>
<td>&gt;50(^a)</td>
<td></td>
</tr>
<tr>
<td>Percentage who saw friends outside school six or more days per week</td>
<td>42.2</td>
<td>34.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average days absent in 9th grade</td>
<td>17.9</td>
<td>14.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10th grade</td>
<td>18.1</td>
<td>15.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11th grade</td>
<td>19.7</td>
<td>16.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12th grade</td>
<td>17.9</td>
<td>14.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade point average in 9th grade</td>
<td>1.7</td>
<td>2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10th grade</td>
<td>1.7</td>
<td>2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11th grade</td>
<td>1.9</td>
<td>2.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12th grade</td>
<td>2.1</td>
<td>2.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cumulative for four grades</td>
<td>2.2</td>
<td>2.3</td>
<td>2.6(^b)</td>
<td></td>
</tr>
<tr>
<td>Percentage who failed a course in 9th grade</td>
<td>56.5</td>
<td>42.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10th grade</td>
<td>56.7</td>
<td>43.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11th grade</td>
<td>54.1</td>
<td>37.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12th grade</td>
<td>30.4</td>
<td>23.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cumulative for four grades</td>
<td>77.4</td>
<td>62.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage retained at grade level at the end of their most recent school year</td>
<td>16.1</td>
<td>6.5</td>
<td>4.0 to 9.0(^c)</td>
<td></td>
</tr>
<tr>
<td>Percentage leaving secondary school by</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduating</td>
<td>41.7</td>
<td>56.1</td>
<td>79.1(^a)</td>
<td></td>
</tr>
<tr>
<td>Dropping out</td>
<td>54.8</td>
<td>36.4</td>
<td>20.9</td>
<td></td>
</tr>
<tr>
<td>Aging out</td>
<td>3.5</td>
<td>7.5</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>132 to 422</td>
<td>1,692 to 4,256</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) National Longitudinal Survey of Youth (U.S. Department of Labor, 1979 to 1983, unpublished). The analysis includes a nationally representative sample of youths who were 15 to 20 years of age when interviewed and currently were in secondary school or had been in the preceding school year.


NLTS source: Students' school records and interviews with parents.
This grade differential may in part result from different standards for assigning grades in the two kinds of classes. However, differences in the behaviors of students with SED in regular and special education classes and/or differences in teachers’ responses to those behaviors may also help explain differences in grades earned in the two settings. Teachers of 12th-graders were asked in an NLTS survey to assess students’ abilities to get along with others in the class, follow directions, and control their behavior in class. Teachers rated students on each item on a 4-point scale, with 1 being “not at all well” and 4 being “very well.” By summing responses, NLTS staff created a 12-point Behavioral Norm Scale. Similarly, teachers were asked to rate how frequently students completed homework on time, took part in group discussion in class, and stayed focused on class work. Responses to these items were summed to form a Task Performance Scale.

Table 4 shows that students with SED were more likely to be rated poorly on both of these scales in their regular education academic and vocational classes than students with disabilities as a whole. However, students with SED were no more likely to receive low ratings on these scales in special education classes and work experience programs than students with any disability. Thus, the perceptions of regular education teachers regarding the behavior and task performance of students with SED may have been an important influence on the low grades and high failure rates of those students in those classes.

When a high school student receives a failing grade, the student receives no credit for the course. If this is a frequent occurrence in a student’s educational experience, he or she begins to fall substantially behind age peers. As shown earlier in Table 2, frequent course failure for students with SED resulted in 16% of them being retained in the same grade at the end of a given year in high school, more than twice the rate of students with disabilities as a whole and substantially above estimated grade retention rates for students in the general population.

When a student “does not get promoted to the next grade along with the rest of the class, everyone knows he has flunked. He will never catch up with his class again.” The temptation to drop out of school is powerful. Among students with SED who had left school, more than half had done so by dropping out (55%), a dropout rate more than twice the rate of students in the general population and the highest of any category of students with disabilities (see Table 2). The large majority of dropouts with disabilities who made it as far as high school stayed there until age 18.7 Thus, they stayed in school as long as other students, but when they dropped out, students with SED had earned an average of only 8.5 credits, well below half of the average of 22 credits earned by students who graduated.

Postschool Outcomes for Students with SED

The discussion above has demonstrated that, when students with SED left high school, more than half had no high school diploma. Combined with their poverty-related disadvantages and the functional deficits noted above, students with SED had several strikes against them in achieving success in their early adult lives. Table 5 demonstrates a poorer pattern of outcomes for young people with SED when they had been out of high school three to five years than for their peers with other disabilities. Youths with SED also lagged behind young people in the general population who had been out of high school a similar length of time and were the same average age. Where the data will allow, this section also compares outcomes for youths with SED to a national sample of youths in the general population which has been adjusted to reflect the same overrepresentation of students who were male, African American, poor, and with heads of households who were not high school graduates as existed among students with disabilities.
Given the frequency of their negative experiences in high school, it is not surprising that only about one-fourth of students with SED had been enrolled in some form of postsecondary school since leaving high school three to five years earlier. This compares with more than two-thirds of the youths in the general population and 62% of disadvantaged youths who were not disabled enrolling in postsecondary schools.29 However, the difference in enrollment was not attributable to the high number of dropouts among those with SED, as might be expected. Even among high school graduates, the rate at which youths with SED had enrolled in postsecondary education (32%) was still less than half the rate of enrollment of high school graduates without disabilities who had been out of high school a similar length of time (not shown in Table 5).

Employment outcomes also lagged for youths with SED when they had been out of high school three to five years (47% then employed) relative to youths with any disability (57%) or youths in general (69%). Virtually none of this difference in employment rates is explained by economic disadvantage; in the general population, students in the disadvantaged comparison group had an employment rate virtually identical to that of the general population (68%).29 Further, when the employment status for youths out of school up to two years was compared with their employment status three years later, young people with SED were less likely than youths with any disability to have been employed at both times and were more likely to have lost employment or to have been employed at neither time than youths with any disability (not shown in Table 5).

In the social realm, young people with SED and other disabilities were less likely than their peers in the general population to be married or living with someone of the opposite sex three to five years after high school. The difference in marriage rates between young people with SED and those in the general population was about the same for both males (14% with SED versus 22% in the general population) and females (27% with SED versus 38% in the general population). However, despite having a lower rate of marriage than young women in the general population, females with SED were significantly more likely to be mothers than their nondisabled peers (48% versus 28%). Even compared with the rates of motherhood among the disadvantaged sample of young women in the general population (34%),

Table 3

<table>
<thead>
<tr>
<th>Grade Level Differentials in Reading and Mathematics by Disability Category</th>
<th>Average Number of Grade Levels Between Tested Ability and Actual Grade Level</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reading</td>
<td>Mathematics</td>
</tr>
<tr>
<td>All conditions</td>
<td>-3.5</td>
<td>-3.2</td>
</tr>
<tr>
<td>Primary disability category</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotionally disturbed</td>
<td>-2.2</td>
<td>-1.8</td>
</tr>
<tr>
<td>Speech impaired</td>
<td>-3.0</td>
<td>-1.5</td>
</tr>
<tr>
<td>Learning disabled</td>
<td>-3.1</td>
<td>-2.7</td>
</tr>
<tr>
<td>Hearing impaired</td>
<td>-3.6</td>
<td>-4.2</td>
</tr>
<tr>
<td>Orthopedically/other health impaired</td>
<td>-4.5</td>
<td>-3.3</td>
</tr>
<tr>
<td>Mentally retarded</td>
<td>-5.6</td>
<td>-5.7</td>
</tr>
</tbody>
</table>

Source: Teacher reports of standardized test results for a subset of NLTS sample members.
the parenting rate was higher for those with SED. No such differences in parenting rates were noted for males (18% with SED versus 14% in the general and disadvantaged populations). One in five single women with disabilities was a mother three to five years after leaving high school, compared with a single-parenting rate of 12% in the general population of women of similar age. Being a mother was related to a significantly lower likelihood of employment and to lower earnings, irrespective of other differences between young women. The high rate of parenting among young women with SED may in part explain their significantly lower rate of employment (19%) compared with young men with SED (57%) or with young women with any disability (40%).

The frequency with which young women with SED were mothers in their early years after leaving high school, particularly single mothers, is cause for concern. The young mothers with SED were themselves disproportionately poor and from single-parent families; with their high rate of early unmarried childbearing, they were beginning another generation of children who will be exposed to the higher probabilities of poverty and family stressors that are associated with female-headed households that were begun when mothers were adolescents. Given the emotional challenges of having SED and the strains of single parenting, the ability of these young mothers to nurture their children and provide environments conducive to positive child development is in question. The combined challenges of disability and single parenting may also put future economic independence out of reach for many young mothers with SED or other disabilities and threaten the futures of their children.

Other social integration indicators continue to reflect the lack of fit that began to be evident in high school between young people with SED and norms of mainstream society. Young people with SED were less likely to be registered to vote when they had been out of school three to five years than were young people with other disabilities or young people in the general population (Table 5). Their arrest rate was 25% up to their first year out of high school, much higher than the rates of youths with other disabilities or youths in the general population (12% and 8%). Further, their arrest rate continued to climb steeply. At the point they had been out of high school three to five years, 58% of youths with

<table>
<thead>
<tr>
<th>Table 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Teachers’ Performance Ratings of 12th Graders with SED and with Any Disability by Placement</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Percentage receiving low rating in</td>
</tr>
<tr>
<td>Regular education academic classes</td>
</tr>
<tr>
<td>Special education academic classes</td>
</tr>
<tr>
<td>Regular education vocational classes</td>
</tr>
<tr>
<td>Work experience programs</td>
</tr>
<tr>
<td>n</td>
</tr>
</tbody>
</table>

Source: Surveys of teachers of 12th-grade NLTS sample members.
| Postschool Outcomes for Youths with SED, Youths with Any Disability, and Youths in the General Population |
|---|---|---|
| **Education** | **Percentages of Youths** | With SED | With Any Disability | In the General Population |
| Ever enrolled in any postsecondary school when out of high school three to five years | 25.6 | 26.7 | 68.3 |
| **Employment** | | | |
| Currently competitively employed when out of high school three to five years | 47.4 | 56.8 | 69.4 |
| Comparing employment when out of school up to two years and three to five years, percentage who were | | | |
| Employed at both times | 23.7 | 33.4 | |
| Employed at neither time | 32.5 | 30.4 | |
| Lost employment | 19.0 | 13.3 | |
| Gained employment | 24.9 | 22.9 | |
| **Social integration** | | | |
| Married or living with someone of the opposite sex three to five years after high school | 17.2 | 19.4 | 29.6 |
| Women who were mothers three to five years after high school | 48.4 | 40.6 | 27.8 |
| Registered to vote three to five years after high school | 42.3 | 50.8 | 66.0 |
| Had ever been arrested | | | |
| About one year after high school | 25.0 | 12.2 | 7.8 |
| Three to five years after high school | 57.6 | 29.5 | |
| **Residential arrangement** | | | |
| Three to five years after high school, youth lived | | | |
| Independently | 40.2 | 37.4 | 60.4 |
| With parents/family members | 45.4 | 54.7 | |
| In settings for those with disabilities (e.g., mental hospitals) | 4.8 | 3.8 | |
| In correctional facilities/other supervised settings | 9.7 | 4.1 | |
| **n** | 44 to 534 | 699 to 5,740 | |

SED had been arrested at some time, the highest percentage and highest rate of increase of any category of youths with disabilities. Arrests were particularly high among dropouts; 73% had been arrested by the time they had been out of school three to five years. Even if youths with SED were actually charged with or found guilty of the actions for which they were arrested no more frequently than other youths, this substantial arrest rate carries with it significant social costs for the crimes committed and for processing and incarcerating the offenders.

Young people with SED were significantly less likely than youths in the general population to have achieved residential independence in the early years after high school (defined as living alone, with a spouse or roommate, in a college dormitory or military housing, not as a dependent). The gap between young people with SED and those in the general population was not closed significantly when the comparison was focused on rate of residential independence of youths who were economically disadvantaged (56%). Youths with SED were more than twice as likely as youths with other disabilities to be living in a correctional facility, halfway house, drug treatment center, or “on the street” (10% versus 4%, respectively).

Possible Contributing Factors

What factors contribute to this consistent pattern of poor outcomes for young people with SED in high school and in the early years of adulthood? Are such outcomes inevitable for these youths, or are there aspects of their school programs or support services that could help youths with SED have relatively more positive experiences? Each individual youth has a unique combination of personal circumstances, of course, which helps to shape his or her life path. However, some shared experiences among students with SED may have contributed to the poor outcomes they achieved.

The vast majority of high-school-age students with SED (88%) attended regular comprehensive high schools, along with an average of 1,150 other students, where their school programs looked very much like those of nondisabled students. Virtually all were assigned to a grade level; only 4% were in an ungraded special education program. As a whole, students with SED in regular high schools averaged 74% of their time in regular education classes (see Table 6); about one-third of students with SED spent all of their time in regular education classes. All students with SED were reported by their regular education teachers to be expected to keep up with other students in their classes; 95% did so, according to their teachers. Yet poor grades were assigned to these students, as noted above.

The majority of 12th-graders with SED (64%) were reported to have a postschool goal of finding competitive employment; only 20% had a goal of college attendance (not shown in Table 6). Despite the nonacademic nature of their goals, academic course taking dominated their high school programs, particularly in 9th and 10th grades, when three of the average of five credits earned were in academic courses. About 80% of students took their academic courses in regular education classes. It was noted earlier that the behavior and task performance of students with SED was rated lowest by teachers in their regular education academic classes, the classes where they spent the large majority of their time.

If students with SED managed to stay in high school until the upper grades, the emphasis on academic course taking diminished somewhat as academic course requirements for graduation were met by some students, and students with SED took occupationally oriented vocational education courses with much greater frequency, in line with their employment goals. The vast majority of vocational courses were in regular education. However, grade point averages and teacher ratings of student behavior...
### Characteristics of the Secondary School Programs of Students with SED and Students with Any Disability

<table>
<thead>
<tr>
<th>Percentage of students whose proportion of time in regular education classes was</th>
<th>With SED</th>
<th>With Any Disability</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>4.2</td>
<td>3.4</td>
</tr>
<tr>
<td>1% to 25%</td>
<td>5.0</td>
<td>6.8</td>
</tr>
<tr>
<td>26% to 50%</td>
<td>10.4</td>
<td>16.3</td>
</tr>
<tr>
<td>51% to 75%</td>
<td>20.3</td>
<td>21.3</td>
</tr>
<tr>
<td>76% to 99%</td>
<td>28.1</td>
<td>31.0</td>
</tr>
<tr>
<td>100%</td>
<td>32.0</td>
<td>21.3</td>
</tr>
</tbody>
</table>

Average percentage of class time spent in regular education classes over four high school grade levels

<table>
<thead>
<tr>
<th>Percentage of 12th-grade students with disabilities in regular education academic classes who</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Were expected to keep up with other students in class</td>
<td>100.0</td>
<td>91.6</td>
</tr>
<tr>
<td>Kept up with other students in class</td>
<td>94.8</td>
<td>85.8</td>
</tr>
</tbody>
</table>

Average academic credits earned in

<table>
<thead>
<tr>
<th>Grade</th>
<th>With SED</th>
<th>With Any Disability</th>
</tr>
</thead>
<tbody>
<tr>
<td>9th grade</td>
<td>3.0</td>
<td>3.2</td>
</tr>
<tr>
<td>10th grade</td>
<td>2.7</td>
<td>3.0</td>
</tr>
<tr>
<td>11th grade</td>
<td>2.7</td>
<td>2.7</td>
</tr>
<tr>
<td>12th grade</td>
<td>2.1</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Percentage taking occupationally oriented vocational education in

<table>
<thead>
<tr>
<th>Grade</th>
<th>With SED</th>
<th>With Any Disability</th>
</tr>
</thead>
<tbody>
<tr>
<td>9th grade</td>
<td>53.7</td>
<td>58.1</td>
</tr>
<tr>
<td>10th grade</td>
<td>58.9</td>
<td>69.5</td>
</tr>
<tr>
<td>11th grade</td>
<td>73.9</td>
<td>79.0</td>
</tr>
<tr>
<td>12th grade</td>
<td>83.8</td>
<td>83.1</td>
</tr>
</tbody>
</table>

Percentage of 12th-grade students receiving following supports in regular education academic classes

<table>
<thead>
<tr>
<th>Support</th>
<th>With SED</th>
<th>With Any Disability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any form of support</td>
<td>87.1</td>
<td>92.1</td>
</tr>
<tr>
<td>Progress monitored by special education teacher</td>
<td>32.3</td>
<td>44.8</td>
</tr>
<tr>
<td>Help taking tests</td>
<td>29.0</td>
<td>41.6</td>
</tr>
<tr>
<td>Study skills assistance</td>
<td>23.5</td>
<td>24.2</td>
</tr>
<tr>
<td>Tutoring by special education teacher</td>
<td>23.1</td>
<td>35.4</td>
</tr>
<tr>
<td>More one-to-one instruction</td>
<td>22.7</td>
<td>27.4</td>
</tr>
<tr>
<td>Study time in special education classroom</td>
<td>19.2</td>
<td>21.0</td>
</tr>
<tr>
<td>Slower-paced instruction</td>
<td>15.6</td>
<td>16.7</td>
</tr>
<tr>
<td>Behavior management program</td>
<td>10.9</td>
<td>6.4</td>
</tr>
<tr>
<td>Teachers’ aides</td>
<td>8.8</td>
<td>7.2</td>
</tr>
<tr>
<td>Peer tutors</td>
<td>7.0</td>
<td>4.5</td>
</tr>
<tr>
<td>Special materials</td>
<td>6.8</td>
<td>14.1</td>
</tr>
<tr>
<td>Modified tests</td>
<td>6.4</td>
<td>10.0</td>
</tr>
<tr>
<td>Modified grading standards</td>
<td>3.3</td>
<td>18.5</td>
</tr>
<tr>
<td>Additional time to complete assignments</td>
<td>2.2</td>
<td>7.2</td>
</tr>
</tbody>
</table>

n 64 to 299 474 to 3,283

Source: Students’ school records and surveys of teachers of 12th-grade NLTS sample members.
generally were higher in vocational courses, despite their regular education placement, than in regular education academic courses.

Teachers reported that most students with SED in regular education classes (87%) were given some kind of support to help them succeed there. However, Table 6 shows that each kind of accommodation was provided to relatively few students and that virtually all accommodations were academic in nature (for example, help in taking tests, slower-paced instruction). The only support cited which was directly related to the behavioral issues that were at the heart of the disabilities experienced by students with SED was behavior management programs, but only 11% of students with SED were reported to have such programs in place in their regular education classes, where they spent the majority of their time.

Few students with SED received other forms of support from their schools outside regular education classes either, particularly in the early high school grades, as shown in Table 7. Receiving personal counseling or therapy was relatively uncommon for students with disabilities as a group, but surprisingly, it was even fairly rare for students with SED, those probably most in need of counseling or therapy. Only between 33% and 39% of students with SED were reported to be receiving personal counseling or therapy from or through their school at any grade level. A survey of 60 school districts revealed that 58% of districts had no capacity to provide counseling or other mental health services.30 NLTS analyses have shown that, if students with SED were not receiving counseling or therapy from their school, they were not likely to be receiving it at all.31

Thus, the disability for which these students were classified as needing special education was emotional or behavioral in nature, yet the special education services they were provided were largely academic. In the absence of consistent counseling or therapy, can more time to take tests or modified grading standards help a student whose disability manifests itself most in conduct disorders or social adjustment problems? NLTS data suggest that few aspects of students’ school programs were directed explicitly to the central nature of their disability.

This apparent disregard for the mental health needs of students with SED seemed to continue into the planning for their transition out of secondary school. Students with SED who stayed in school until 12th grade were less likely than other students with disabilities to have their schools involved in transition planning on their behalf (see Table 7) and less likely to have any plans that were made formalized in writing.32 Consistent with the employment goals of students with SED, employers were most frequently contacted by schools on behalf of students with SED. However, no student with SED had transition planning done on his or her behalf which involved contacts between the school and any mental health agency to arrange for mental health care after high school. The sink-or-swim attitude that characterized the regular-education-dominated high school programs of many students with SED continued through to their postschool transition, where many floundered for some time, ultimately sinking into unemployment and/or criminal justice system involvement.

For many students, the situation improved little when they left school. The service system for persons with SED is characterized by “an atmosphere of waiting lists, program gaps, and uneven adult services.”33 Unlike special education, which is a single system that is intended to take responsibility for providing services considered necessary for students with disabilities to benefit from their educational programs, there is no unified system of services outside school to help people with disabilities achieve their maximum independence after leaving school. Instead, there can be a vast array of service providers, some facilitating a broad range of services to individuals with many types of disabilities (for example, vocational
rehabilitation), others specializing in specific types of services (for example, psychological counselors), and still others serving only individuals with particular disabilities (for example, developmental disabilities agencies). Criteria for eligibility differ from agency to agency, and both perseverance and good fortune are required for many young people or their families to find the help they need. A recognition of the serious shortcomings of this service system and its poor linkages to schools is reflected in the National Agenda for Achieving Better Results for Children and Youth with Serious Emotional Disturbance, which includes as Target #7 the promotion of systems change to support the development of comprehensive, collaborative, coherent systems of care that are family centered, community based, and appropriately funded.13

However, not all students with SED are reported to need services from the often-confusing adult service system. Parents of 56% of out-of-school youths with SED

Table 7

<table>
<thead>
<tr>
<th>Mental Health Services Provided to or Planned for Students with SED and Students with Any Disability by or Through Their Secondary Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
</tr>
<tr>
<td>With SED</td>
</tr>
<tr>
<td><strong>Percentage receiving personal counseling or therapy from or through their schools in</strong></td>
</tr>
<tr>
<td>9th grade</td>
</tr>
<tr>
<td>10th grade</td>
</tr>
<tr>
<td>11th grade</td>
</tr>
<tr>
<td>12th grade</td>
</tr>
<tr>
<td><strong>n</strong></td>
</tr>
<tr>
<td><strong>Percentage of 12th-graders with</strong></td>
</tr>
<tr>
<td>Any transition planning done on their behalf</td>
</tr>
<tr>
<td>A written transition plan</td>
</tr>
<tr>
<td>Transition planning involving contacts made on behalf of the students by the school with</td>
</tr>
<tr>
<td>Employers</td>
</tr>
<tr>
<td>State vocational rehabilitation agencies</td>
</tr>
<tr>
<td>Colleges</td>
</tr>
<tr>
<td>Job placement programs</td>
</tr>
<tr>
<td>Military</td>
</tr>
<tr>
<td>Postsecondary vocational training programs</td>
</tr>
<tr>
<td>Supported employment programs</td>
</tr>
<tr>
<td>Other vocational training programs</td>
</tr>
<tr>
<td>Social service agencies</td>
</tr>
<tr>
<td>Sheltered workshops</td>
</tr>
<tr>
<td>Group homes</td>
</tr>
<tr>
<td>Mental health agencies</td>
</tr>
<tr>
<td><strong>n</strong></td>
</tr>
</tbody>
</table>

Source: Interviews with parents and surveys of teachers of 12th-grade NLTS sample members.
reported that their young adult children with SED did not need or get personal counseling or therapy, despite their designation as SED while in school. Perhaps this lack of need for service reported by parents reflects parents’ lack of awareness of the therapeutic needs of their young adult children. Alternatively, the absence of reported need among a majority of youths with SED may result from successful programs of medication controlling emotional problems or from youths “outgrowing” the behavioral problems or conduct disorders that had troubled them and their schools.

Yet, 44% of youths with SED who had been out of high school three to five years did need counseling or therapy, according to parents, and only 27% of those reported to need such help were getting it (or about 12% of all out-of-school youths who had been classified as SED in school). Youths of color were reported to need counseling services at higher rates than white youths, but were less likely to be receiving it. Only 18% of youths with SED who had unmet needs for counseling or therapy were actively seeking such help or had someone seeking help for them. Active seeking of services to meet needs was more common for white youth and those with better-educated parents.

**What Works?**

Although this discussion has demonstrated that many young people with SED experienced little in their high school programs or in the adult service system to help them achieve positive outcomes, this experience is not inevitable. NLTS multivariate statistical analyses have identified several factors that are related to significantly better outcomes. The range of these potentially beneficial factors illustrates that there is no single locus of responsibility for improving outcomes for youths with SED; parents, schools, and other community organizations all can contribute to that end.

**Parent Involvement**

Findings regarding children with SED confirm what is known about the importance of parents in the lives of all children. Key factors in student success in general are the extent to which the family encourages learning, expresses high expectations for children, and becomes involved in their school and community life. Consistent with this, students with disabilities whose parents were more involved in supporting their education while in high school (for example, who monitored students’ progress in school and/or helped with homework) were estimated to miss five fewer days of school per year and to be 25% less likely to fail a class than their peers with less involved parents, independent of socioeconomic and other differences between them. Further, controlling for demographic and school program differences, youths with disabilities whose parents were more involved in their education during high school were significantly more likely to go on to postsecondary schools than other youths with disabilities. Similarly, youths with disabilities whose parents had high expectations for their postschool outcomes were significantly more likely to have achieved those outcomes than other youths, independent of other differences between them in demographics or school programs. These findings support the current federal initiatives to increase parental participation in the process of developing both the Individualized Education Plans (IEPs) and Individualized Transition Plans (ITPs) for students with disabilities (the plans that state goals for students during school and in the transition out of school and specify the services schools will provide or arrange for in helping students meet those goals).

**Vocational Education**

Emphasizing the importance of parental roles does not absolve schools from doing what they can to improve outcomes for students with SED. Permitting flexibility in
course taking so that students with SED can pursue their vocational interests is an important option. Students with disabilities who took occupationally oriented vocational courses in high school were significantly less likely to drop out than nonvocational students with disabilities, controlling for other differences between them. In addition, high school vocational students with SED and other "mild" disabilities were estimated to be 36% to 40% more likely than nonvocational students to have achieved competitive employment and were estimated to earn between $4,000 and $6,200 more per year, depending on the intensity of the vocational program they took in high school. Yet widespread efforts to increase academic course requirements for high school graduation have had the effect of limiting rather than expanding curricular options for students who do not have academic postschool goals.

Placement Options
Choices among placement options also can influence the success of students with SED. The NLTS has found that regular education placements have significant but mixed relationships to student outcomes. Social goals that students, parents, and schools might have for placing students with disabilities in regular education classes appear to be furthered by those placements. Controlling for differences in demographic characteristics and disability, students with disabilities who spent more time in regular education classes were less likely to be socially isolated and more likely to belong to school or community groups during high school than similar students who spent less time in regular education classes. However, spending more time in regular education academic classes was powerfully associated with a higher rate of course failure for students with disabilities, independent of disability and other factors, and a high failure rate, in turn, is among the strongest predictors of students dropping out of school. If students were successful enough to have stayed in school, however, their regular education and academic course experiences appear to have benefited them in their later years. Graduates with SED who spent more time in regular education classes and in more advanced academic classes while in high school were significantly more likely to have gone on to further postsecondary education and to have attained residential independence in their early postschool years than other youths with similar disabilities, controlling for other factors in statistical analyses.

Social Integration
Schools also can support the social integration of students with disabilities into the life of the school. NLTS multivariate analyses reveal that, independent of other differences between them, students with disabilities who belonged to social, sports, hobby, or other kinds of groups while in high school missed significantly less school and had significantly lower probabilities of failing courses and dropping out than students who were not affiliated with groups while in school. Schools can encourage the development of a wide range of options for group affiliations that will appeal to the interests of a wide variety of students and actively instruct students with SED in the social skills needed to succeed in such groups. At the time the NLTS was collecting data, intentional instruction in social skills was not common for students with SED, and opportunities for planned social integration were rare or artificial.

Collaboration
Although opportunities for improving outcomes for students with SED are available to most schools, their focus on the traditional school activities of course work and student interactions continues to ignore the explicit mental health needs of students and the constellation of family-related stresses that are common to students with SED. Schools are unlikely to be able to address these complex and multifaceted issues alone; collaboration with mental health and social service agencies is required to construct wraparound services that can meet the multiple needs of many
students with SED and their families. Indeed, calls for collaboration are now common in the special education field. However, it is interesting to note that, even when special educators encourage embracing a broader notion of collaborative relationships, the collaboration that is encouraged is generally between elements of the school community—regular and special educators, vocational and academic educators, preservice teacher trainers of different disciplines—and between schools and parents, but not explicitly with agencies outside the school.

Yet advocates for the needs of students with SED are actively calling for policymakers and practitioners to “strengthen the policy commitment to enhance collaboration between schools and mental health agencies.” The response from the school side of that equation to this call has become more visible recently. For example, in reauthorizing the Individuals with Disabilities Education Act (IDEA) in 1990, Congress established a grant program that would “develop the knowledge, skills, and strategies for effective collaboration among special education, regular education, related services, and other professionals and agencies [20 U.S.C. sec. 1426(a)(4)] specifically to serve more effectively students with SED. In a similar vein, in 1993, the Office of Special Education Programs (OSEP) acknowledged that “our nation’s schools need a reorientation of the fundamental approach to addressing the diverse and complex patterns of psychological and social behavior presented by students, including those with serious emotional disturbance. Academically focused reform initiatives may potentially divert, not strengthen, the ability of schools to meet the psychological, social, and behavioral needs of students. Schools increasingly acknowledge that noneducational services are vitally needed, but the needs often go unmet.”

Reflecting this recognition, OSEP announced an “absolute priority” to support research and demonstration programs focused on the effective participation of students with disabilities, including SED, in comprehensive programs of school-linked education, health, mental health, and social services. Postschool transition planning activities also are encouraged to “initiate cooperative models among educational agencies and adult service agencies, including vocational rehabilitation, mental health, mental retardation, and public employment and employers” [20 U.S.C. sec. 1425(b)(6)].
On the mental health side of this potential partnership, too, there are promising efforts to link with schools. In California, for example, a network of primary intervention programs, with a majority of funding from the state Department of Mental Health and county mental health agencies, makes mental health professionals available in schools to provide 12 to 15 sessions of counseling to identified students to help them cope with behavioral issues and family stresses. Nationally, the Comprehensive Community Mental Health Services Program for Children with Serious Emotional Disturbance, authorized through Public Law 102-321, grants funds to states to establish systems of care for children and adolescents with SED which are community based, family centered, and provided through a coordinated multiagency network, which includes schools.

Data such as those provided by the NLTS have sounded a wake-up call to policymakers, educators, other human service practitioners, parents, and students about the pervasive negative outcomes experienced by many students with SED, outcomes associated with high personal and social costs. Continued assessment of the outcomes for students with SED will be needed to determine whether school reform efforts—and program improvement initiatives undertaken to better these efforts—meet that important goal.


14. Two other categories, autism and traumatic brain injury, were added in 1990 in legislative amendments. Autism had previously been included within the category of other health impaired. Students with traumatic brain injury were variously classified, according to school district policy or to the nature of the functional deficit caused by the injury.

15. The distribution of younger students differs from this figure in that there are fewer students labeled learning disabled and more labeled speech impaired among elementary than secondary-school-age students.


32. Readers should note that NLTS data were collected before implementation of the transition planning requirements of the 1990 Individuals with Disabilities Education Act.


The Tennessee Study of Class Size in the Early School Grades

Frederick Mosteller

Abstract

The Tennessee class size project is a three-phase study designed to determine the effect of smaller class size in the earliest grades on short-term and long-term pupil performance. The first phase of this project, termed Project STAR (for Student-Teacher Achievement Ratio), was begun in 1985, when Lamar Alexander was governor of Tennessee. Governor Alexander, who later served as secretary of education in the cabinet of President George Bush, had made education a top priority for his second term. The legislature and the educational community of Tennessee were mindful of a promising study of the benefits of small class size carried out in nearby Indiana, but were also aware of the costs associated with additional classrooms and teachers. Wishing to obtain data on the effectiveness of reduced class size before committing additional funds, the Tennessee legislature authorized this four-year study in which results obtained in kindergarten, first, second, and third grade classrooms of 13 to 17 pupils were compared with those obtained in classrooms of 22 to 25 pupils and in classrooms of this larger size where the teacher was assisted by a paid aide. Both standardized and curriculum-based tests were used to assess and compare the performance of some 6,500 pupils in about 330 classrooms at approximately 80 schools in the areas of reading, mathematics, and basic study skills. After four years, it was clear that smaller classes did produce substantial improvement in early learning and cognitive studies and that the effect of small class size on the achievement of minority children was initially about double that observed for majority children, but in later years, it was about the same.

The second phase of the project, called the Lasting Benefits Study, was begun in 1989 to determine whether these perceived benefits persisted. Observations made as a part of this phase confirmed that the children who were originally enrolled in smaller classes continued to perform better than their grade-mates (whose school experience had begun in larger classes) when they were returned to regular-sized classes in later grades. Under the third phase, Project Challenge, the 17 economically poorest school districts were given small classes in kindergarten, first, second, and third grades. These districts improved their end-of-year standing in rank among the 139 districts from well below average to above average in reading and mathematics. This article briefly summarizes the Tennessee class size project, a controlled experiment which is one of the most important educational investigations ever carried out and illustrates the kind and magnitude of research needed in the field of education to strengthen schools.
Because we have all gone to school, we each have ideas about how to improve the system. For example, James Garfield once said that a pine log with a student on one end and Mark Hopkins, a beloved president of Williams College, on the other would be an ideal university. But if we want to improve school systems, we need to consider what changes may be practical and effective. Setting aside the discomfort of outdoor logs during New England winters, would Garfield’s design have made effective use of President Hopkins’s time? Aristotle, even when tutoring the young Alexander before he was called “the Great,” is believed to have had more than one student per class.

The size of the class is largely under control of the school system, and its choice influences the size and number of classrooms and the number of teachers required, and so class size is naturally a concern of parents, teachers, and school administrators. Everyone is concerned that the pupils receive adequate attention and that the teachers are able to control their classes. Some courses seem to need more teachers per student than others. For example, classes in carpentry or cooking, in which hazardous tools and equipment are used, may require closer supervision than a class in arithmetic.

The effects of class size on children’s learning have been studied, usually without reaching definitive conclusions. Most research on class size has compared the performance of pupils in classes of different sizes in such cognitive subjects as reading, mathematics, or social studies. Designing and executing these studies is difficult not only because parents may object to variation in the treatment of children but also because of the constraints that must be imposed if anything of value is to be learned from the investigation. Groups to be compared following different treatments need to be equivalent at the start. The treatments must be carefully described and delivered. Suitable measures of performance must be chosen. Beyond all this, a healthy atmosphere toward the investigation must be created; otherwise, the study can be easily sabotaged. It does not take many unwilling workers or full-time grumblers to spoil a research program.

In the 1980s, conditions favorable for a study of class size evolved in the state of Tennessee. Governor Lamar Alexander had established education as a top priority for his second term. Members of both the state legislature and the educational community in Tennessee had been intrigued by a modest-sized study in the state of Indiana, called Project Prime Time, which investigated the effect of reduced class sizes in kindergarten and first and second grades. For example, Bain and Achilles¹ report that, in Project Prime Time, (1) students in smaller classes scored higher on standardized tests than did those in larger classes, (2) the smaller classes had fewer behavioral problems, and (3) teachers of smaller classes reported themselves as more productive and efficient than they were when they taught larger classes.

The Tennessee legislators and teachers were also aware of an investigation by Glass and colleagues² which reviewed the vast literature on the effects of class size on learning using a special quantitative method called
meta-analysis. The results of this investigation suggested that a class size of 15 or fewer would be needed to make a noticeable improvement in classroom performance. At the time of the Glass study, the effect of class size on performance was controversial because many studies in the literature differed in their outcomes. The new methods used by Glass and his colleagues were not accepted by all professional groups. At the same time, there were ongoing discussions about the lesser cost and possibly equal effectiveness of placing paid teachers’ aides in elementary classrooms. Because of the additional expense associated with a reduction in class size for early grades, members of the Tennessee legislature decided that any proposed innovation should be based on solid information and, therefore, authorized a four-year study of class size which would also examine the cost-effectiveness of teachers’ aides. The legislature appropriated $3 million in the first year for a study of pupils in kindergarten and then appropriated similar amounts in subsequent years for the project, which carried the acronym STAR (for Student-Teacher Achievement Ratio).³

The study was carried out in three kinds of groups: (1) classes one-third smaller than regular-sized classes, (2) regular-sized classes without a teacher’s aide, and (3) regular-sized classes with a teacher’s aide. By comparing average pupil performance in the different kinds of classes, researchers were able to assess the relative benefits of small class size and the presence of a teacher’s aide. The experiment involved many schools and classes from inner-city, urban, suburban, and rural areas so that the progress of children from different backgrounds could be evaluated.

**Study Design and Execution**

Personnel from four Tennessee universities helped design and execute the Tennessee study, which was carried out in three phases (see Box 1). Each year, $2.5 million was spent on additional teachers and teachers’ aides. The remaining funds were used to gather and analyze the data and to carry out other obligations imposed by the enabling legislation.

Legislation for the STAR experiment required that studies be made of classes in inner-city, suburban, urban, and rural schools. Because the legislators did not define these types of residential areas, the study makers had to invent categories appropriate for Tennessee and their experiment. To do so, they placed inner-city and suburban schools in the category of metropolitan areas. Inner-city schools were defined as those in which more than half of the students received free or reduced-price lunches. Schools in outlying areas of metropolitan cities were called suburban. In nonmetropolitan areas, schools in towns of more than 2,500 serving primarily an “urban” population were called urban, and the rest were classified as rural.

To be eligible to participate in the experiment, a school was required to sign up for four years and to have at least 57 children for any given grade (to comprise a small class of 13 and two classes of 22). This constraint assured the ability to make comparisons among the three kinds of classes within a single school. Participating schools received no extra support other than funds for additional teachers and aides and had to supply the extra classrooms. In any given calendar year, the experiment was carried out in one grade only, and this minimized the number of new classrooms needed. No new textbooks or curricula were to be introduced. Although 180 schools offered to participate, only 100 were large enough to qualify, and 79 actually participated in the kindergarten year.

The treatments planned for the program were started in 1985, beginning with
kindergarten and continuing each year through first, second, and third grades. The classes were of three types: (1) small, 13 to 17 pupils; (2) regular size, 22 to 25 pupils; and (3) regular size with a teacher’s aide. The small classes averaged 15 pupils, down about 35% from the average regular size of about 22 or 23. During the first year, the study involved about 6,400 pupils in 108 small classes, 101 regular-sized classes, and 99 regular-sized classes with teachers’ aides.

Within a school, pupils and teachers were assigned to classes at random each year to ensure that classes came from equivalent populations and that teachers did not choose their classes. In a study of this kind, randomization protects against all variables that might matter, whether they have been identified or not.

A teacher’s aide had no specific duties but helped each teacher of a regular-sized class in whatever way the teacher wished. Some aides participated in teaching, others prepared materials and kept records, and some carried out all of these duties. Teachers’ aides were paid.

Analysts report that attendance was about 95%, independent of school location, type of class, or minority or nonminority status.

Table 1 indicates the composition of the experimental groups by giving a breakdown of schools by city type and of classes by city type and ethnicity at the end of the first grade (second year of the experiment). This table shows participation by 6,572 pupils in 331 classes at 76 schools and is important because it indicates that enough pupils were studied to enable researchers to reach a conclusion. Ultimately, the findings from the investigations repeated themselves at least qualitatively in nearly every large cell of Table 1, suggesting that the study findings apply to poor and well-to-do, farm and city, minority and majority children. The magnitude,
control, and duration of the experiment illustrate the sort of investigations that are needed to improve education in the schools.

**Examining and Interpreting the Findings**

In assessing student performance, two types of tests were used: (1) standardized tests, which have the advantage of being used nationally but the disadvantage of not being directly related to any particular curriculum or course of study; and (2) curriculum-based tests, which reverse the advantages and disadvantages of standardized tests. Curriculum-based tests measure more directly the student’s increased knowledge of what was actually taught, but they give little indication of where local results stand in the national picture.

The first graders took two standardized tests in reading: (1) the Stanford Achievement Test (SAT) for word study skills and reading, and (2) the Tennessee Basic Skills First (BSF) test for reading, a curriculum-based measure. In mathematics, first graders took one SAT (standardized) and one BSF (curriculum-based) test.

When an experiment applies a new treatment or employs a new method, one way of comparing the effects of this new approach with those previously achieved using old treatments or methods is by expressing individual test scores in terms of standard deviation (see Box 2) and then expressing group differences as effect sizes (see Box 3). Here, *effect size* is defined as the difference between means divided by the standard deviation for individuals in the regular classes without aides. Thus Table 2 shows the effect sizes for small classes compared with the average of the performance of the regular-sized classes with and without aides for the standardized tests. Both math and reading scores show a benefit of about one-fourth of a standard deviation.

To interpret the gains represented by these effects, it is useful to consider a pupil who, without a special treatment such as attending small classes, would achieve about the average score, say at the midpoint or 50th percentile, of all students.

<table>
<thead>
<tr>
<th>Composition of the First Grade Cross-Sectional Sample in the Second Year of the Tennessee Experiment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
</tr>
<tr>
<td>Number of schools</td>
</tr>
<tr>
<td>Number of classes</td>
</tr>
<tr>
<td>All majority students</td>
</tr>
<tr>
<td>All minority students</td>
</tr>
<tr>
<td>Mixed classes</td>
</tr>
<tr>
<td>TOTAL CLASSES</td>
</tr>
<tr>
<td>Number of students</td>
</tr>
</tbody>
</table>

When considering distributions of quantities such as heights of people, family incomes, and scores on standardized tests, it is often useful to think first of the typical person, family, or score and then to represent that typical one by either the mean (average) of the numbers or the median (value of the middle measurement).

This drawing is of a distribution about the mean. The total area between the curve and the horizontal axis is one (or 100% of the measurements, incomes, or scores). For distributions that are approximately symmetrical, about half of the measurements lie to the right of the mean and half to the left. The slightly asymmetrical mountain-shaped (or bell-shaped) curve indicates roughly the way that many types of measurements distribute themselves in large populations, with the height of the curve representing the density of the scores at various positions. Typically, the distributions are dense in the middle and are less dense as one moves farther from the middle in either direction.

For many common distributions of everyday quantities, it is convenient to relate the mean and a measure of variability called the standard deviation to the fraction of measurements falling within a symmetrical interval about the mean. For example, this drawing indicates that the proportion of measurements falling in the interval that goes from one standard deviation to the left of the mean to one standard deviation to its right is about two-thirds. This number is not exact but is a rough approximation for distributions that are shaped generally like the one pictured.

What about the interval that includes the mean plus or minus two standard deviations? In the same approximate sense, this interval contains about 95% of the measurements for many distributions occurring in practice. If the interval is extended to three standard deviations each way from the mean, it will include nearly all—almost 100%—of the measurements.
The Tennessee Study of Class Size in the Early School Grades

What would a gain of one-fourth of a standard deviation do for such a pupil? That pupil would move from the 50th percentile of all pupils up to the 60th percentile, thus surpassing an additional 10% of the population beyond the 50% that were exceeded originally. Thus, an increase of one-fourth of a standard deviation can amount to considerable gain in performance.

In the study report, the average performance of small classes was compared with the average for all regular-sized classes with or without an aide. The resulting gain is shown in the first line of Table 2. The second line of that table shows the effect size of the gain from having an aide in the regular-sized class compared with the performance in the regular-sized class without an aide. When the effect of the small class is compared with that of the regular-sized class without an aide, the numbers in the first row of Table 2 increase to 0.30, 0.25, 0.32, and 0.15, respectively.

When performance of classes with an aide is compared with that of regular-sized classes without an aide, the gain averages about one-twelfth of a standard deviation. In other words, the average gain associated with an aide is about 35% of the gain achieved by reducing class size from regular to small.

Of special interest is the effect of class size on minority students. At the end of the second year of the experiment, in small classes compared with regular-sized classes and regular-sized classes with an aide, the effect size for minorities was about double that for majorities, averaged over the four tests. This extra gain occurred only in the first two years of the experiment; thereafter, the gains of both groups were about the same.

The original plan of the study was that all students would remain in their class types for all four years of the experiment. But after the first year, parents of students in regular classes objected to the continuation of the assignments. As a result of discussions with parents and with the people guiding the experiment, in the second year, students in the regular-sized classes with and without the teacher's aide were randomly reassigned half to classes with a teacher's aide and half to ones without, but the assignments to small classes remained unchanged. Such changes were not allowed in later years. It was the view of the advisory group from the four universities that continued changes would make it impossible to interpret the results of the experiment. As a result of the changes that had been allowed, at the end of the second year, there were four situations in the regular classes for those who had attended kindergarten and first grade: (1) two years without an aide, (2) two years with an aide, (3) first year without an aide and second year with an aide, and (4) first year with an aide and second year without.

Schools had an influx of children in first grade who had not attended kindergarten the first year of the experiment. (Subsequently, kindergarten became required in Tennessee.) These children had to be assigned to the experiment in participating schools. This led to some separate analyses of results from kindergarten and first grade (for years one and two of the experiment) and of results from first, sec-

Of special interest is the effect of class size on minority students. The effect size for minorities was about double that for majorities.
Effect Size

When an experiment applies a new treatment whose consequences are to be compared with those of the old or standard treatment, the difference in their consequences is often called the size of effect of the new treatment. For standardized tests, information is usually available which gives the distribution of scores for members of large populations who take the tests. Frequently, these distributions look like the common distributions described in Box 2. They are shaped approximately like distributions called Gaussian, or normal, in English-speaking countries. (When used in this way, the term normal means “usual, customary, or related to the norm” and does not connote an ideal situation or a desirable state of being.) The shapes of these curves are often well described by a formula that requires knowing only their mean and standard deviation.

Suppose that the national mean of a certain test is 500 and that its standard deviation is 100. Suppose as well that a new method of teaching produces higher test scores in an experimental group than would have been achieved without it, say a distribution with a mean of 550 instead of the usual 500. One way of thinking about this situation is to view the effect as shifting the original distribution to the right by 50 points—essentially adding 50 points to everyone’s score.

To interpret the value of this gain requires knowing how variable the scores are. If, for example, the standard deviation is 1,000 instead of 100, then 50 points does not look like much of a gain; but if the standard deviation is 10, a gain of 50 points is astounding because it represents a gain of five standard deviations, when a gain of only three standard deviations would take a student from an average score to one of the best scores that had ever been made.

One interpretable quantity is the gain represented as a fraction of the standard deviation of the original distribution. In this example, the fractional gain would be 50/100 = 0.5, or half a standard deviation. An improvement of half a standard deviation would move people who were originally at the mean, which is also about the 50% point on these distributions, up to about the 69% point. Thus, a person who originally scored higher than half the population would now score higher than 69%.

This particular ratio of gain to the standard deviation is often called the effect size, a technical term that has a more specific meaning for such tests than the general notion of size of effect, which refers to any method of describing changes. In practice, effect sizes of half a standard deviation are rare.

Although effect sizes of the magnitude of 0.1, 0.2, or 0.3 may not seem to be impressive gains for a single individual, for a population they can be quite substantial. For example, a 0.2 effect size corresponds in the United States to the difference between the average heights of 15-year-old versus 16-year-old girls. For large numbers of girls of each age, this average difference may seem small, but most people notice it. An effect size of 0.3 corresponds to about 30 points on a SAT verbal or mathematics standardized test.

How much does computer-based instruction help students learn when it is offered as an adjunct to traditional teaching in certain settings? A review of 59 studies finds a mean effect size of 0.25 for computer-based instruction. And, as a result of this finding, computer-based instruction is viewed as an extraordinarily promising innovation—one that might revolutionize education.

Sources:

The Tennessee Study of Class Size in the Early School Grades

In the third year of the four-year study, questions were raised about the persistence of effects when children returned to regular-sized classes, as they would in fourth grade, and so an additional sum was appropriated for a three-year follow-up observation called the Lasting Benefits Study (LBS). As a part of this study, researchers observed the performance of children who had been in the three types of experimental classes during kindergarten and the first, second, and third grades after they returned to regular-sized classes in the fourth, fifth, sixth, and later grades.

In a paper presented at a meeting of the North Carolina Association for Research in Education at Greensboro, North Carolina, Achilles and colleagues reported on the Lasting Benefits Study. These authors found that, in the fourth and fifth grades, the children who had originally been in small classes scored higher than those who had been in regular-sized classes or in regular-sized classes with a teacher’s aide. In the fourth grade—the first year after return to regular-sized classes—the effect size was about one-eighth of a standard deviation, averaged across six different cognitive subjects studied, and in the fifth grade, it was nearly two-tenths of a standard deviation, again averaged across six subjects. Within each grade, the different subjects produced almost the same effect size, though the observed gain was somewhat larger for the fifth grade. Curiously, in both of these years, the effect size systematically favored the regular-sized classes previously without a teacher’s aide over those previously with an aide, though the difference was small, averaging about 0.03 over all subjects in both grades. The encouraging finding is that early experience with the smaller class size seems to have had a continued effect beyond the moment when the children returned to regular-sized classes.

Table 2

<table>
<thead>
<tr>
<th>Gains in Effect Sizes from Small Classes</th>
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<tbody>
<tr>
<td>Gains in effect sizes from small classes in first grade compared with all regular-sized classes and from regular-sized classes with an aide compared with regular-sized classes without an aide</td>
</tr>
<tr>
<td>SAT Reading</td>
</tr>
<tr>
<td>.23</td>
</tr>
<tr>
<td>.14</td>
</tr>
</tbody>
</table>

As a consequence of the systematic findings of improvement in performance of pupils in small classes over those in regular-sized classes, Tennessee implemented reduced class sizes for beginning students in kindergarten and first, second, and third grades in a program called Project Challenge (refer to the description of Phase 3 in Box 1) in the 17 school districts with the lowest per capita income and the highest percent of free or reduced-price lunch participation among students.

In the summary report for Project Challenge, Nye and colleagues observe that, in the school districts where small classes were installed in kindergarten, first, second, and third grades, both the reading scores and the math scores improved, compared with previous performance by children in these districts and with other schools in the state. The gains in effect sizes were 0.4 for reading and 0.6 for mathematics. Before the small classes were introduced, these districts had been performing well below the average for the state in mathematics; after the intervention, they moved above the average.

It should be noted that the gains recorded here are not part of a carefully controlled experiment; they are consequences of installing the program. For this reason, the comparisons are not as well equated as they were in the original investigation. To measure experiment gains would require carrying out new class size experiments in the districts where the program is being implemented. Belief in the continuing benefits of the program is based on the uniform improvement found in the experiment for all types of classes in all types of cities. The additional evidence based on norms during the implementation phase, while reassuring, must be regarded as weaker because this new investigation is less well controlled.

An additional way to report the progress gives the average rank of the test scores of the 17 Tennessee districts in Project Challenge (among the 139 districts) for the years reported so far (1989–1993) in reading and mathematics. The results reported by Achilles, Nye, and Zaharias for the second grade are shown in Table 4.

### Table 3

<table>
<thead>
<tr>
<th>Grade level</th>
<th>Percentile&lt;sup&gt;a&lt;/sup&gt;</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>K</td>
</tr>
<tr>
<td><strong>Total reading SAT</strong></td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td>59</td>
</tr>
<tr>
<td>Regular without an aide</td>
<td>53</td>
</tr>
<tr>
<td>Regular with an aide</td>
<td>54</td>
</tr>
<tr>
<td><strong>Total math SAT</strong></td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td>66</td>
</tr>
<tr>
<td>Regular without an aide</td>
<td>61</td>
</tr>
<tr>
<td>Regular with an aide</td>
<td>61</td>
</tr>
</tbody>
</table>

<sup>a</sup> Percentile ranks are based on Stanford’s multilevel norms.

Belief in the continuing benefits of the program is based on the uniform improvement found in the experiment for all types of classes in all types of cities.
When these districts are ranked from 1 to 139, where 1 indicates best academic performance and 139 indicates the worst, the average rank for all districts is 70. Note that in mathematics, the average rank for 1991–92 and for 1992–93 is below 60 (and so above the median) so that the 17 districts have shown a startling improvement as well as a gain of 20 ranks in reading for second grade. The same report mentions that the corresponding analysis of first grade shows that the 17 districts were better than average in both reading and mathematics in 1992.7

In summary, the evidence is strong that smaller class size at the beginning of the school experience does improve the performance of children on cognitive tests. Observations from the Lasting Benefits Study confirm that the effect continues into later grades when children are returned to regular-sized classes. In addition, the implementation of the program for the economically poorest districts seems to be improving the performance of children in these districts by noticeable amounts. In regular-sized classes, an aide produced some gain in kindergarten and in the first, second, and third grades; but when students returned to regular-sized classes, the gain from aides did not persist. After the small classes were implemented in all 17 school districts, no further observations were made about the in-classroom value of paid teachers’ aides.

Special Concerns

During the course of the experiment, researchers made two substantial departures from the basic plan: they rerandomized regular-sized classes during the second year and moved incompatible children. In addition, researchers instituted a teacher training program between the second and third year.

### Second-Year Rerandomization in Regular-Sized Classes

As reported earlier, one departure from the original plan occurred in the second year, when the children in regular-sized classes were rerandomized to regular-sized classes with an aide and regular-sized classes without an aide. Such a change applied to all who had entered the experiment in kindergarten. From the point of view of those beginning in kindergarten, it created four rather than two regular-sized groups of classes for analysis and comparison, as described above. After the second year, the children in regular-sized classes continued with their second-year assignment. This change complicates the analysis for all children except those whose assignments remained unchanged and makes it difficult to assess accurately the effectiveness of having or not having a teacher’s aide.

---

**Table 4**

| Average Second Grade Ranks for the 17 Districts Among the 139 School Districts for Early Years of Project Challenge |
|---|---|---|---|
| Reading | 99 | 94 | 87 | 78 |
| Mathematics | 85 | 79 | 60 | 56 |

Moving Incompatible Children

One benefit reported from the Indiana study was that behavioral problems were reduced in the smaller classes. Nevertheless, in Project STAR at the end of the first year, 48 students moved from small kindergarten classes to regular classes with an aide, and 60 moved to regular classes without an aide. Thus, the number of students moved from small classes was 108 of 1,678 students. This move was intended to separate incompatible children and “to achieve sexual and racial balance,” the latter a puzzling remark in light of the purported emphasis on randomization. No mention is made of what was done about incompatible students who were already in regular-sized classes. Perhaps there was nowhere to move them if there was only one small class or perhaps children seem more incompatible in small classes. A school administration planning to reduce class sizes might want to keep this potential difficulty in mind.

It is impossible to assess the impact of this reassignment on the experiment; and, in fact, it may have had little impact because the affected students may have been removed from the analysis altogether.

The Teacher Training Program

The added feature in Project STAR came between the second and third years, when it was decided to give a special training course to 57 teachers. The enabling legislation had specified teacher training. Essentially, all teachers were getting some additional training as a routine matter in Tennessee, but apparently it was felt that the legislation called for something special. The participating teachers in 15 selected Project STAR schools were all given a total of three days of special training. The training was the same for all teachers selected; their assignment to small or regular-sized classes had not yet been made. When one considers that 30% of these teachers already had 20 years of teaching experience and only four had fewer than 3 years of experience, a three-day training program seems modest. As it turned out after the training, the classes with trained teachers performed the same as did the classes with untrained teachers.

Class Size Drift

In addition, the sizes of the classes drifted a bit as time went on. Some small classes...
became larger than their intended upper bound, and some regular-sized classes became smaller than their intended lower bound. The overall outcome of these violations of the original distributions should be to underestimate the effectiveness of the small classes compared with that of the regular-sized classes.

Assessing the Implications of the Study

Smaller Class Size

Why does smaller class size help teaching and learning? Reducing a class from 23 to 15 reduces the number of children in the room by about one-third. Having fewer children in class reduces the distractions in the room and gives the teacher more time to devote to each child. However, the impression one gets from reading papers emerging from Project STAR is that at least some teachers and administrators engaged in the study think of themselves as dealing with a start-up phenomenon. When children first come to school, they are confronted with many changes and much confusion. They come into this new setting from a variety of homes and circumstances. Many need training in paying attention, carrying out tasks, and interacting with others in a working situation. In other words, when children start school, they are confronted with many changes and much confusion. They come into this new setting from a variety of homes and circumstances. Many need training in paying attention, carrying out tasks, and interacting with others in a working situation. In other words, when children start school, they need to learn to cooperate with others, to learn to learn, and generally to get oriented to being students. These observations fit neatly with several current theories of education, including the idea of frames and scripts.11–16

The experiment showed that the minority groups gained more than others in the first two years of the experiment; and although the last two years showed benefits comparable with those of the majority, there was a falling off of benefit. Some statements in the report by Word and colleagues3 suggest that much of the gain from the small classes was achieved in the first two years. The data presented in Table 3 do not show the falling off, but other summary tables from the study might.

Optimum Class Size

The idea of an ideal, or optimum, class size is open to question. This investigation did not provide information about a variety of class sizes. Within the ranges of what is affordable, it is reasonable to suppose that smaller classes are preferable for beginners. But some desired training probably could not be accomplished in classes of such small sizes as one or two pupils even if they were affordable. Learning to work in a group is important and requires the presence of others.

Persistence of Beneficial Effects

In the Lasting Benefits Study,4 a continuation of studies evaluated the performance of students from small classes as compared with the performance of students from regular-sized classes or regular-sized classes with an aide after all students had returned to regular-sized classes. The results always favored the students from smaller classes. One year later (1989–90), the effect sizes ranged from 0.11 to 0.16 (n = 4,230) in the fourth grade, and then, in subsequent years, from 0.17 to 0.34 (n = 4,639) in the fifth grade, from 0.14 to 0.26 (n = 4,333) in the sixth grade, and from 0.08 to 0.16 (n = 4,944) in the seventh grade. Data from the eighth grade have been gathered and are being analyzed. Thus, year after year, the students who were originally in smaller classes continued to perform better than the students from regular-sized classes with or without a teacher’s aide.17

Conclusion

Compelling evidence that smaller classes help, at least in early grades, and that the benefits derived from these smaller classes persist leaves open the possibility that additional or different educational devices could lead to still further gains. For example, applying to small classes the technique of within-class grouping in which the teacher handles each small group separately for short periods could strengthen
the educational process (essentially a second-order use of small class size). The point is that small classes can be used jointly with other teaching techniques which may add further gains.

Because a controlled education experiment (as distinct from a sample survey) of this quality, magnitude, and duration is a rarity, it is important that both educators and policymakers have access to its statistical information and understand its implications. Thought should be given by both public and private organizations to making sure that this information is preserved and well documented and that access to it is encouraged. The Tennessee three-phase study calls attention to the statewide controlled experiment as a valuable device for assessing educational interventions and, thereby, improving school systems.

The preparation of this material was supported in part by a grant from the Andrew W. Mellon Foundation to the American Academy of Arts and Sciences in support of the Center for Evaluation of its Initiatives for Children program. The author’s efforts have been helped by the kind responses of people who worked on the Tennessee class size project and have kept him in touch with project publications as they have appeared. Professors C.M. Achilles and J.D. Finn have given helpful advice and information. In addition, suggestions from John Emerson, Richard Light, Marjorie Olson, Jori Raymond, Jason Sachs, and Cleo Youtz improved early versions of the manuscript.


7. See note no. 6, Achilles, Nye, and Zaharias, Appendix B, p. B-1.


In 1989, then President Bush and the state governors established six goals for education in America. Goal number one was that “by the year 2000, all children in America will start school ready to learn.”1 There are few who would dispute the importance of this goal. Arriving at school healthy and developmentally ready to participate actively in classroom activities undoubtedly plays an important part in a child’s school experiences. On its face, and certainly in spirit, making sure that children start school ready to learn is a laudable goal.

Even though the goal of having children start school ready to learn is praiseworthy, as a guide to policy implementation, this statement is proving problematic. In general, to be an effective guide for policy, a goal statement should use well-defined terms, be clearly stated, and be measurable. However, the concept of “readiness” is poorly defined and is interpreted differently in different contexts. Even the basic assumptions of the goal statement have been contested: is it the children who should be ready for school or the schools that should be ready for the children, or the society that should provide appropriate support for the children and the schools? Regardless of who or what is to be ready, there is no system in place to measure how ready to learn our nation’s children are as they begin school or how well equipped schools are to receive children at different levels of development. This is due, at least in part, to the lack of consensus on what constitutes readiness and how to measure it. The decentralization of the U.S. education system, with monitoring and decision making shared by state governments and local school districts, also contributes to the difficulties in measuring school readiness.

Despite the general lack of agreement on what constitutes readiness or how to measure it, this Child Indicators article explores some of the issues surrounding measurement of the nation’s progress toward reaching its readiness goal. After all, most children born in 1995 will start kindergarten in the year 2000. It is therefore appropriate to ask not only how we can ensure that these children are, in fact, ready to learn by the time they start school, but also how we will know whether they are ready and whether...
policies instituted between now and then can increase the likelihood of their being ready. This article also briefly considers the unresolved issue of where responsibility for readiness lies—whether it is the child’s responsibility to be ready for school at the appointed time or the school’s responsibility to be ready for the child no matter what his or her background, experience, and developmental status.

This short article is arranged in three parts. The opening section examines three concepts of readiness. The next section examines national survey data on parent and teacher ideas about what constitutes readiness for individual children. The data also provide a rough indication of how close the nation was to achieving the readiness goal in the early 1990s from the points of view of parents and teachers. Although these survey data do not offer an official or objective measure of the readiness status of children entering school, in the absence of other national data collection efforts, such survey data may provide the only means of directly evaluating progress on readiness for some time to come. The last section of this article examines some of the indicators and benchmarks that have been proposed to measure progress toward the readiness goal.

**Defining Readiness**

The statement that all children “start school ready to learn” combines in a single goal statement two historically different concepts—readiness for learning and readiness for school. Readiness to learn, generally, has been thought of as the “level of development at which an individual (of any age) is ready to undertake the learning of specific materials.” When applied to a population or group, it refers to the age at which the average individual has the specified capacity. This concept of readiness, although perhaps useful in some situations, is not very helpful in assessing progress toward the national goal. As the National Association for the Education of Young Children has pointed out, “Every child, except in extreme instances of abuse, neglect, or disability, enters school ready to learn.” Merely being “ready to learn” something may not, however, guarantee success in school.

The concept of school readiness tethered the notion of readiness for learning to a standard of physical, intellectual, and social development that enables children to fulfill school requirements and to assimilate a school’s curriculum. Unfortunately, while some idea of a standard is nearly universal in readiness discussions, there is little agreement as to exactly what that standard should include. Some studies have examined characteristics of children which are associated with higher achievement test scores, but there is little agreement regarding the totality of the necessary and sufficient ingredients for readiness. As a result, there is a lack of good tools for measuring the school readiness of individual children, and the meaning of the available data is often debated.

Faced with a dearth of good tools and a desire to make sure that only children who are developmentally ready enter school, some school systems have resorted to entrance testing. A 1989 survey (the most
recent data available) found that kindergarten or school entrance screening tests were required in 16 states, and in 7 additional states, more than half of the districts required testing. The use of readiness screening tests as tools for determining fitness to enter school is frequently denounced by educators and others. For instance, the American Academy of Pediatrics recently issued a statement declaring that readiness screening instruments should not be the sole criterion for determining when a child enters school. Holding children to a standard also introduces the possibility that children will be judged not ready because of the substantial variability in the rate of normal child development among children of similar ages. Variability in the environments to which children are exposed during their preschool years also contributes to variability in school readiness. And, because different schools have different requirements and curricula, children who may be considered ready for some schools might be judged unready for others. Moreover, whether children themselves are ready for school may not be an important issue in flexible school systems which are designed to accommodate entering children with different levels of ability and maturation.

Historically, chronological age has served as the major criterion for school entry. Because children develop at different rates, however, the establishment of a specific chronological age range for children to begin school ensures that some children who satisfy the chronological age criteria will not be as able to fulfill rigorous school requirements as others. This variability in readiness due to the large normal variability in development among children of the same age is compounded by the variability in the ages at which children actually enter kindergarten. While many children enter kindergarten as young as age four, the majority enter at age five, and about 8% are held back each year to begin school when they are age six. Because some aspects of development, such as language skills, are strongly related to chronological age, older children typically do better in school during the early grades than do their younger classmates. This has led to the policy of deferring school entry for some children—who are judged, either on the basis of age or ability, not ready for school—so that they may be better prepared for school entry in subsequent years. The policy of delaying kindergarten entry is carried to its extreme in those school districts and states that have systematically raised the official age for school entry. For instance, the state of Florida has raised the entrance age by four months since 1975 by moving the cutoff birth date for entry from January 1 back to September 1.

This policy, however, does not really address age-related variability in the abilities of children in an entering class because the average age of the students simply increases; the age span in a class remains unchanged.

Increasing the age of entry encourages schools to make kindergarten curricula more demanding because some children who once would have been first grade age are now in kindergarten instead. Downward displacement of academic content and expectations to earlier and earlier grades, partly a result of school reform and efforts to hold schools accountable for measurable outcomes, means that some children who might at one time have been able to take kindergarten in stride may no longer be able to keep up. Therefore, in an effort to keep up with societal demands for rising standards of educational achievement in the later grades, schools may raise the age of entry to increase the likelihood that kindergartners will succeed in the more demanding environment.

Despite these and other problems that arise in attempting to define and apply concepts of school readiness, parents, teachers, and school administrators frequently make critical decisions for individual children based on their own notions of this concept. The next section examines what can be learned from national surveys about parent and teacher perceptions of the components of school readiness and the status of America’s children.
Surveys

As discussed above, one result of the recent increase in public attention to readiness is an illumination of the problems with the available data on school readiness and the lack of tools for measuring it. At present, direct measurement of kindergarten readiness is nearly impossible because of the lack of agreed-upon definitions and standards and of data about children’s capacities as they enter school.

Because of concern about the readiness status of children in the United States, several surveys have attempted to address the readiness question despite the lack of good measurement criteria. To circumvent this problem, they did not attempt to directly measure the proportion of children who were ready for school but instead asked parents and teachers their opinions about children’s readiness and the characteristics that are necessary for a child to be ready for school. Kindergarten teachers and parents are key figures in decisions about school readiness, often making the final determination of whether or not a child will enter kindergarten in a given year. Therefore, it is helpful to know what they consider to be the key aspects of being ready and the proportion of children they believe are ready for school.

This article discusses three national surveys in which teacher and parent opinions about readiness are elicited. The first is the school readiness component of the 1993 National Household Education Survey (NHES), sponsored by the National Center for Education Statistics. In the spring of 1993, the NHES surveyed the parents of 2,126 kindergartners (as well as parents of 8,762 other children) in the United States about their child’s educational experiences. Parents responded to a series of questions concerning their opinions about the generic importance of several characteristics in determining whether any child was ready for school. Parents also reported what their child’s teacher had told them about their child’s performance in school in several areas such as sleepiness, spoken communication, enthusiasm, restlessness, and taking turns, and answered several questions about their child’s educational experiences (such as being held out or retained).

The second survey, also sponsored by the National Center for Education Statistics, was designed to learn specifically about the beliefs and judgments held by kindergarten teachers concerning school readiness. The Kindergarten Teacher Survey on Student Readiness (KTSSR) surveyed 1,339 public school kindergarten teachers primarily by mail in the spring of 1993. This survey asked questions similar to those asked as a part of the NHES about the importance of certain attributes and attitudes to any child’s readiness for kindergarten, as well as other characteristics of the teacher’s classroom and experiences. The KTSSR did not, however, ask the teachers what proportion of their students were ready for school, data which might have provided a helpful indicator of teacher’s perceptions of the general level of readiness among children. The most recent survey asking that question was the National Survey of Kindergarten Teachers (NSKT) sponsored by the Carnegie Foundation for the Advancement of Teaching. Conducted in the fall of 1991 as a supplement to the Foundation’s report on school readiness, the NSKT recorded the opinions of kindergarten teachers about the readiness of the children in their classes who entered school in the fall of 1990. Surveys were mailed to more than 20,000 kindergarten teachers, and approximately 7,000 responded, for a response rate of about 35%. Because this response rate is low, the representativeness of the sample is difficult to determine. The results should be interpreted with caution. Two NSKT questions are of particular interest for this discussion: “What percentage of your students are not ready to participate successfully in school?” and “How
does the readiness of your students compare to five years ago?"

**Parent and Teacher Conceptions of Readiness**

Figure 1 illustrates the views of parents and teachers about the characteristics a child needs to be ready for school, using data from the 1993 NHES and KTSSR. From the KTSSR, we learn that teachers believe that being physically healthy, rested, and well nourished is the most important part of readiness for school; nearly 75% said that it was “essential,” and no teacher rated health below “somewhat important.” The next few bars in Figure 1 represent other nonacademic characteristics, including communication skills, enthusiasm, and taking turns, which both a majority of teachers and parents felt were essential or very important for kindergarten readiness.

While parents and teachers are in basic agreement about the order of importance of the different characteristics of school readiness, parents were more likely than teachers to judge basic academic skills as important. For example, while nearly 60% of parents felt that knowing the alphabet before entering kindergarten was “essential” or “very important,” only 10% of teachers agreed.

### Are Children Ready?

In this section, several data sources are used to examine the proportion of children that parents and teachers feel are ready. The Carnegie NSKT asked kindergarten teachers directly about their perceptions of the readiness of their students. The teachers indicated that, in the fall of 1990, approximately 65% of their students were ready for school. While this seems to be a straightforward measure of teacher perceptions of readiness, the survey’s low response rate (35%) and lack of a clearly stated definition of school readiness suggest that it may be helpful to look to other sources for estimates of the proportion of kindergartners who are ready for school.

Using what is known about what teachers believe to be important, along with parental reports of teacher assessments, one can roughly assess teachers’ views of the readiness status of the kindergartners represented in the NHES. First, consider how kindergartners were rated on each of the five characteristics (health, communication, enthusiasm, taking turns, and restlessness) on which data are available and which teachers most frequently identified as essential or very important for kindergarten readiness. The five bars of Figure 2 represent answers to the NHES survey questions that match most closely the top readiness characteristics according to teachers who responded to the KTSSR. While data from the NHES do not match the KTSSR questions exactly, the NHES provides a sense of the proportion of kindergarten children who have problems in school with each characteristic.

Figure 3 shows the proportion of students whose parents reported positive assessments from their children’s teachers on five, four, three, or fewer than three of the five characteristics of readiness presented in Figure 2. Readiness is a multidimensional concept, and these data do not include all the attributes of readiness that a majority of the teachers identified as important in the KTSSR. Nonetheless, it is noteworthy that 63% of children were reported as having received positive assessments on all five characteristics. The proportion is comparable to the proportion of students reported as ready to participate successfully in school in the Carnegie NSKT. The remaining 37% of kindergartners who did not receive positive assessments on all five were presumably on average less ready than those students with five positive assessments, but without more information, it is not possible to determine the proportion of children in this group who were not ready to participate successfully in school.

Another very crude measure of school readiness is actual student experiences related to kindergarten. Some children are held out of school when they are old enough to be eligible to enroll, usually by
Parents and teachers are arguably the most important forces in a child’s early school experiences. This graph, which uses parent responses from the 1993 National Household Education Survey (NHES) and teacher responses from the 1993 Kindergarten Teacher Survey on Student Readiness (KTSSR), presents the characteristics that parents and teachers believe are important for being ready to begin kindergarten. For some characteristics, such as physical health and following directions, data is available only for teacher responses from the KTSSR because no parallel question was asked of parents in the NHES.

- Teachers were more likely to rate good health as essential or very important than any other characteristic.
- Parents and teachers agree that both the ability to communicate needs, wants, and thoughts verbally in a child’s primary language and the qualities of being enthusiastic and curious in approaching new activities are very important aspects of school readiness.
- Substantially more parents than teachers believe that the more academic items, such as counting to 20 or knowing the letters of the alphabet, are important for school readiness.

their parents or teachers. The 1993 NHES shows that between 8% and 9% of children eligible for kindergarten by chronological age wait to enroll until the following year. Studies of small areas have found that many schools have substantial numbers of over-age kindergartners, particularly among boys.12 Parents and teachers may feel that children who are born close to the enrollment cutoff date or who have other perceived or real disadvantages would be better served by waiting a year and being among the older students in their class. Although it has been shown that older students are inclined to do better than younger ones in kindergarten, these differences tend to disappear by the third grade.9 A large problem with holding out is that it doubles the age span represented in the kindergarten class from 12 to 24 months. As a result, students who are of typical kindergarten age may be at a disadvantage throughout their academic careers if they continue to be grouped with classmates who are more than a year older than they. In addition, children who are held out may experience problems if they feel “too old” for their classmates as they mature. The increased age span also presents problems for teachers, who must now teach groups of children who are more diverse in age and experience than before.12 In any event, the parent or teacher making the decision to hold a child out feels that, for some reason, the child is not as ready at the time as he or she will be in a year.

Some kindergarten students are retained in grade, repeating their kindergarten...
Figure 3

**Percentage of Children Who Possess Readiness Characteristics**

Parent reports of teacher assessments in the 1993 NHES and kindergarten teacher judgments of their students' readiness in the 1991 Carnegie NSKT

<table>
<thead>
<tr>
<th>1993 NHES</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fewer than three</td>
<td>2%</td>
</tr>
<tr>
<td>Three of the five</td>
<td>9%</td>
</tr>
<tr>
<td>Four of the five</td>
<td>26%</td>
</tr>
<tr>
<td>All five characteristics</td>
<td>63%</td>
</tr>
</tbody>
</table>

The five NHES characteristics
- Not sleepy or tired in class
- Not hard to understand what the child is saying
- Enthusiastic and interested in lots of different things
- No trouble taking turns or sharing
- Not restless; sits still

<table>
<thead>
<tr>
<th>1991 Carnegie NSKT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Not ready</td>
<td>35%</td>
</tr>
<tr>
<td>Ready</td>
<td>65%</td>
</tr>
</tbody>
</table>

What percentage of your students are not ready to participate successfully in school?

The figure on top shows the proportion of students whose parents reported positive assessments from their children's teachers on five, four, three, or fewer than three of the five characteristics of readiness presented in Figure 2. The parent reports of teacher assessments of their children come from the 1993 National Household Education Survey (NHES). These characteristics, shown in Figure 2, are the ones that teachers frequently reported as at least "very important" for readiness in the Kindergarten Teacher Survey on Student Readiness (KTSSR). The figure on the bottom illustrates teacher responses to a question on school readiness from the 1991 Carnegie National Survey of Kindergarten Teachers (NSKT).

- Sixty-three percent of students received positive teacher ratings on all five readiness characteristics in the NHES. The Carnegie NSKT found that, according to teachers, about 65% of kindergarten students were ready to participate successfully in school.
- Almost 90% of children received positive ratings on at least four of the five characteristics reported in the NHES.

year. Students who are retained in kindergarten are, by some measure, not considered to be ready enough to go on to the next grade. According to the 1993 NHES, approximately 6% of kindergartners attend two or more years of kindergarten. Other studies have found that even higher proportions of students are retained in the first grade—between 5% and 14% in individual states. While retention does indicate that a child at the conclusion of one grade was not felt to be prepared for the next grade, it may not by itself be a good indicator of the readiness of children. Retention might also be an indicator of the ability of a school to deal with the needs of a particular child.

The goal for the year 2000 is that all children start school ready to learn. According to the data from the surveys considered in this article, as many as one-third of kindergartners may not have been ready in the early 1990s. Therefore, it is helpful to consider the direction of any trend in readiness to assess progress toward the national goal. There are no trend data available on readiness per se, but the recollections of kindergarten teachers are suggestive. In the Carnegie NSKT, kindergarten teachers responded to the question, “How does the readiness of your students today compare to five years ago?” The basis for the teachers’ answers was left to the teachers themselves: they were to compare their students today with their recollections of their students five years ago on whatever characteristics they considered to be important. Some 25% of teachers felt that today’s kindergarten students were more ready than those of five years ago, while 42% felt that fewer students were ready now than before. The trend, based on this single survey question, is not encouraging. However, teacher perceptions and expectations may change over time, and the relationship between teacher reports and actual readiness is unknown.

### National Benchmarks for Readiness

America 2000, the education strategy that placed readiness at the top of the agenda, includes a plan for measuring the nation’s success in achieving the goal that all children in America will start school ready to learn by the year 2000. Under the plan, success in reaching this goal will not be measured directly because direct measurement would involve collection of data about individual children which is not routinely collected and for which no commonly accepted measures exist. Instead, success will be determined by progress toward three major subgoals, or objectives, which focus on the broader themes of access to services for which ongoing data are more routinely available:

**Objective 1:** All children will have access to high-quality and developmentally appropriate preschool programs that help prepare children for school.

**Objective 2:** Every parent in the United States will be a child’s first teacher and devote time each day to helping such parent’s preschool child learn, and parents will have access to the training and support parents need.

**Objective 3:** Children will receive the nutrition, physical activity experiences, and health care needed to arrive at school with healthy minds and bodies, and to maintain the mental alertness necessary to be prepared to learn, and the number of low birth weight babies will be significantly reduced through enhanced prenatal health systems.

These objectives make intuitive sense. For example, with rare exceptions, increasing parent involvement in a child’s life should improve the child’s confidence and readiness for school, and teachers report that good health and nutrition are essential to readiness (see Figure 1).

There is more than one effort to try to determine the nation’s progress toward the three objectives. The National Education Goals Panel, which was established...
as an independent federal agency in 1994, has chosen four indicators to measure progress toward the objectives: a children’s health index (the percentage of infants born with two or more health or developmental risks), immunization rates, family-child reading and storytelling, and participation in preschool. These four indicators do not directly measure progress toward all parts of the objectives, but rather focus on the more measurable portions. The indicators are tracked each year in a series of reports published by the Panel. The reports also track where the nation should be on each indicator each year to reach the objectives by the year 2000. Members of the National Governor’s Association (NGA) have also proposed a more extensive group of indicators (or “benchmarks”) of progress toward each of the three objectives based on available and potentially available data sets. For example, one benchmark they propose for the first objective is the percentage of eligible children enrolled in Head Start and public preschool programs. In general, the benchmarks relate to specific outcomes which together cover various aspects of the health, welfare, and service utilization of young children. However, unlike the National Education Goals Panel indicators reports, the NGA does not prescribe specific goal levels for the individual benchmarks. The lack of specified goal levels would make it difficult to know whether the nation has achieved its readiness goals using these criteria.

### Conclusion

Two closely related questions lie at the heart of the uncertainty surrounding the measurement of school readiness and the readiness goal for education in America: How will measurement of readiness be used? Who is responsible for ensuring that children are ready?

Frequently, the measurement of readiness in school settings has involved the testing or screening of kindergarten-age children to determine whether they meet the entry standards of the school. This use of readiness measurement places responsibility on parents and children to meet a standard set by the school. The relatively recent phenomenon of holding out is another example of parents themselves taking the responsibility for determining the proper time for school entry based on some concept of readiness. Even the wording of the national goal suggests that it is the child who should be ready for learning and for school, not the school that should be ready for the child.

An alternate perspective, however, is that readiness be considered a quality of the schools, rather than of the children. Under such a scenario, entry standards could be based solely on age so that all children, regardless of their language, income, or gender, would start school at a specific time, and school services would be individualized to meet each child’s needs. Measurement of progress in readiness would then focus on school characteristics, such as the number of kindergarten-age children in kindergarten or the availability of varied levels and forms of instruction. However, shifting the onus for readiness from the child to the school may frequently require difficult institutional changes (such as increased individualization of curricula and classrooms for students at different levels), and changing to this concept of readiness will take time.

The objectives for the national readiness goal place a large measure of responsibility on society at large. They widen the definition of readiness to include many aspects of child health and well-being, while placing little responsibility on the schools for accommodating children. A limitation of this approach is that it may give insufficient attention to traditional concepts of readiness as perceived and acted upon by parents and teachers. It does not directly acknowledge the roles that parents and schools can play in facilitating readiness. In addition, diffusion of accountability to the level of society at large may result in dissipation of desire, focus, and effort and render the goal more difficult to achieve.
Reaching a consensus on where responsibility lies or how responsibility should be shared among families, schools, and society at large should be a critical first step in developing better indicators of school readiness. Shared responsibility may imply that more than one single measure of readiness will be appropriate. Progress toward the goal that all children start school ready to learn will likely require that more attention and resources be directed toward the determination of what it is that the nation means by school readiness.

The helpful comments of Keith Crnic of Pennsylvania State University and Sharon Lynn Kagan of Yale University are appreciated, as are the comments of Mary Larner, Deanna Gomby, Richard Behrman, and Patricia Shiono.


10. See note no. 4, Crnic and Lamberty.


13. The NHES sample comes from households, and is an attempt to learn more about the aspects of children’s education outside of school institutions. If there were one or two eligible children in the household, the school readiness interview was conducted with parents for those children. If there were more than two eligible children, two children were selected at random and the parent was interviewed about those children only.


18. The 11 characteristics shown in Figure 1 do not include all of the characteristics asked about in the KTSSR. The survey also asked teachers the importance of these characteristics: finishes tasks, has good problem-solving skills, knows the English language, and identifies primary colors and basic shapes. (See note no. 16, Fast Response Survey System.)


20. While the survey asked teachers to refer to their class in the fall of 1990, it is not clear that the teachers used this group as their reference. (Personal communication with Sharon Lynn Kagan, senior associate, Bush Center in Child Development and Social Policy, Yale University, April 19, 1995.)

21. However, as previously noted, in the KTSSR there were other attributes that teachers more frequently considered to be “very important” or “essential” for readiness than taking turns, including not being disruptive, being sensitive to other children’s feelings, and following directions. Because we want to examine child-level readiness characteristics found in the NHES, the information presented here is for only those characteristics for which there is information from both the NHES and the KTSSR.


25. See note no. 1, Action Team on School Readiness, p. 6.