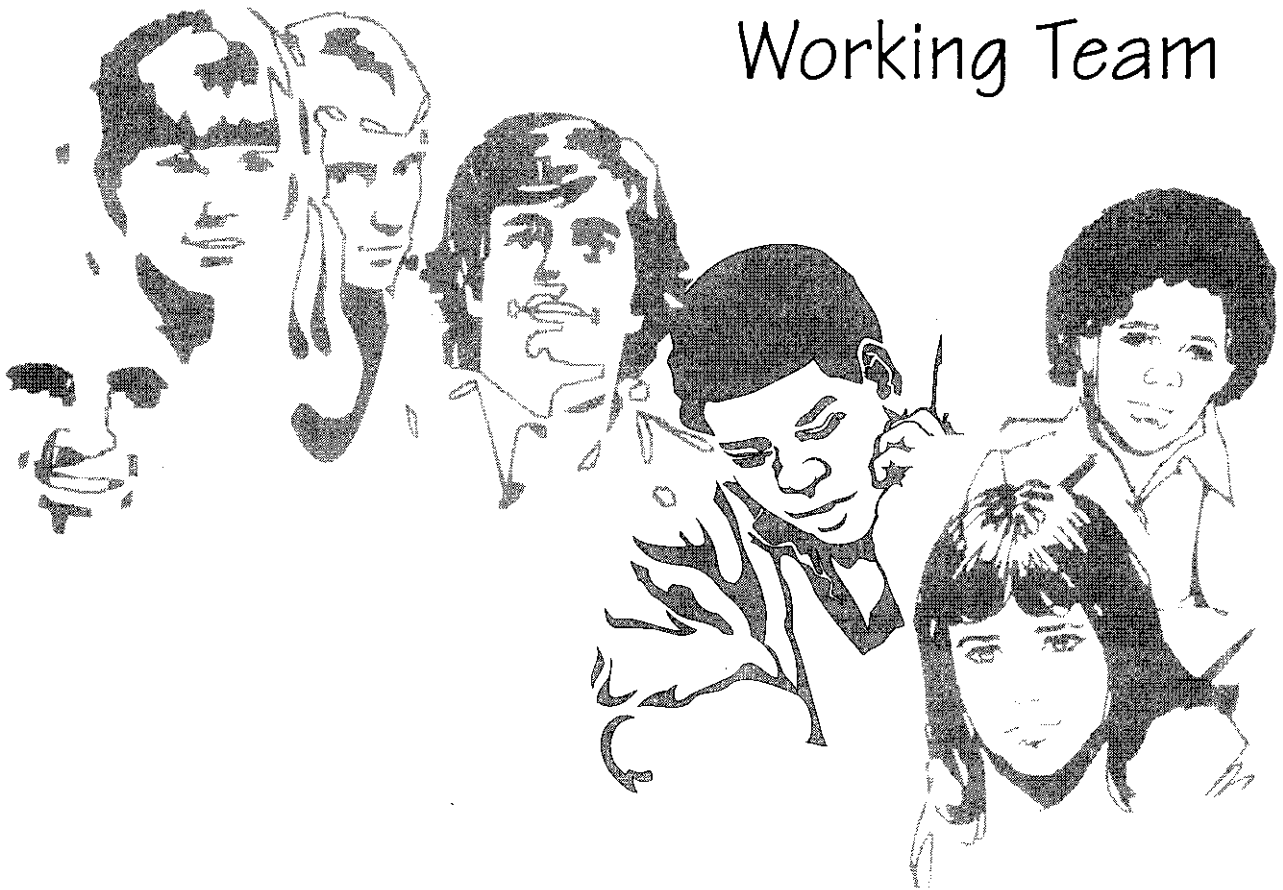


National Institute for Occupational Safety and Health
NIOSH

Special Hazard Review

Child Labor Research Needs

Recommendations from the
NIOSH Child Labor
Working Team



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

CDC
CENTERS FOR DISEASE CONTROL
AND PREVENTION

SPECIAL HAZARD REVIEW

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August 1997

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PREFACE

The Occupational Safety and Health Act of 1970 emphasizes the need for standards to protect the safety and health of American workers. To fulfill this need, the National Institute for Occupational Safety and Health (NIOSH) has developed a strategy for disseminating information that will help employers protect their workers from workplace hazards. This strategy includes the development of NIOSH Special Hazard Reviews, which support and complement the major standards development and hazard documentation activities of the Institute. These documents deal with hazards that merit research and concern from the scientific community even though they are not currently suitable for comprehensive review in a criteria document or a Current Intelligence Bulletin. NIOSH *Special Hazard Reviews* are distributed to the occupational health community at large—industries, trade associations, unions, and members of the academic and scientific communities.

ABSTRACT

The Child Labor Working Team of the National Institute for Occupational Safety and Health (NIOSH) presents child labor research needs identified as of July 1996 and recommends inter-agency collaborations. In addition, the Team supplies information about youth employment, occupational injury and illness in young workers, Federal and State regulation of child labor, and national objectives for the occupational safety and health of youths. The Team also describes 10 NIOSH projects focused on young workers in 1996.

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EXECUTIVE SUMMARY

The National Institute for Occupational Safety and Health (NIOSH) Child Labor Working Team was formed in April 1994 to identify research, surveillance, and intervention actions to prevent injuries and illnesses among working children and adolescents. This *Special Hazard Review* presents the research needs identified by the Team and their recommendations for interagency collaborations as of July 1996. The document uses available data to identify research needs and opportunities for prevention.

Research needs were identified through the diverse expertise and research of Team members and presentations by outside experts. The recommendations in this report were shaped by the following complementary goals:

- To reduce injuries and illnesses resulting from childhood exposures to hazardous work environments
- To promote positive, encouraging, successful, and healthy introductions to working life
- To foster knowledge and skills in safety and health that will remain with youths throughout their working lives and enable them to be active participants in shaping their work environments

Concerns about the employment of children are not new. Child labor laws enacted in the early 1900s resulted in substantial improvements in working conditions and in the number of children receiving an education. Recent research by NIOSH and others has demonstrated that concerns about child labor cannot be restricted to the past. Although numerous gaps exist in our information, it is clear that

employment and occupational injuries and illnesses among children and adolescents are common in the United States. In 1995, an estimated 2.6 million adolescents aged 16 and 17 were employed. Each year, approximately 70 youths die from injuries at work; hundreds are hospitalized; and tens of thousands require treatment in hospital emergency rooms. Children and adolescents have a relatively high risk for occupational injury compared with adults.

Characteristics of youths that differentiate them from older workers (and may increase their risk for occupational injuries and illnesses) include minimal work experience, factors associated with physical and psychosocial development, and the need to balance the demands of school and work. Research on the psychosocial aspects of youth employment have found both positive and negative outcomes. Positive outcomes include the acquisition of basic job skills and enhanced self-confidence and self-esteem. Negative effects include decreased school performance, increased use of alcohol, decreased participation in extracurricular activities, and a consistent pattern of inadequate sleep.

Stakeholders concerned with the occupational safety and health of youths include employers, parents, youths, educators, medical providers, and others interested in the well-being of youths. Efforts are needed to increase awareness of occupational safety and health issues among stakeholders and encourage efforts to prevent occupational injuries and illnesses among children and adolescents. Efforts to promote the safe and healthful employment of these workers can benefit from the broad perspective of community health education.

Children and adolescents are protected by a patchwork of regulations. The Occupational Safety and Health Administration (OSHA) regulations apply to children and adolescents as well as to older workers. Except for exposure to ionizing radiation, OSHA regulations do not differentiate on the basis of age. However, Federal child labor laws provide specific protection for children under age 18. Federal child labor regulations include restrictions on both occupations and hours of work for children under age 16. In addition, the Secretary of Labor declares certain jobs to be too hazardous for minors to perform (Hazardous Occupations Orders). The minimum age for performing work that has been declared hazardous by the Secretary is 16 years in agriculture and 18 years in nonagricultural industries. NIOSH submitted comments when the U.S. Department of Labor (DOL) published an Advance Notice of Proposed Rulemaking in 1994. Several bills have been considered by Congress this year to limit enforcement of or modify specific Hazardous Occupations Orders. States also have child labor laws, which may be stricter than Federal laws. State workers' compensation laws affect data that are collected in each State. In addition, some State workers' compensation laws provide for increased rates or fines with child labor law violations, and many States limit legal remedies that may be pursued when children are injured or killed at work.

Multiple national objectives, both inside and outside the Federal government, intersect with the mission of the Team. The Secretary of the U.S. Department of Health and Human Services (DHHS), *Healthy People 2000*, the School-to-Work Opportunities Act, the Goals 2000—Educate America Act, and the American Public Health Association (APHA) all call for providing students with an education that will prepare them for work. *Healthy People 2000*

includes a specific objective to reduce work-related injury rates among adolescent workers. Youths are a priority area at the Centers for Disease Control and Prevention (CDC), and "special populations at risk," which explicitly includes young workers, is a priority research area in the *National Occupational Research Agenda*. Other groups calling for research into the occupational safety and health of youths include the National Committee for Childhood Agricultural Injury Prevention, the National Safety Council Agricultural Division, APHA, and the Child Labor Coalition. APHA and the Child Labor Coalition have both urged coordination of efforts across multiple government agencies.

Most NIOSH research and activities have implications for workers of all ages—with the exception of research focused on industries or occupations in which children and adolescents have minimal employment, or special populations excluding children and adolescents. As of July 1996, NIOSH had 10 research projects that take into account the unique characteristics and needs of working children and adolescents. These projects range from the collection and analysis of data on exposures or outcomes to community-based demonstration projects. The impacts of these projects will not be restricted to working children and adolescents: they will affect the general workforce as well as the future workforce.

When identifying occupational safety and health research needs for children and adolescents, the Team considered existing knowledge, current research efforts, and needs expressed by stakeholders. The following are research needs identified by the Team:

- Improved surveillance of work-related injuries and illnesses in children and adolescents

- Etiologic research to identify risk factors leading to work injuries and illnesses of children and adolescents, with particular attention to risk factors that may be specific to youths
- Research to support assessments of the age-appropriateness of specific work tasks
- Intervention research to identify effective prevention strategies
- A model for the healthful employment of children and adolescents, with rigorous assessment of diverse benefits for employers

- Research to promote occupational safety and health education for adolescents and a safe environment in school-based or -facilitated work experience programs
- Refinement and expansion of community-level interventions to promote safe and healthful work experiences for children and adolescents

Because child labor involves multiple stakeholders, we need routine communication, collaboration, and coordination among Federal agencies such as DOL, the U.S. Department of Agriculture, the U.S. Department of Education, and other agencies within DHHS. Funding by multiple agencies for some projects should be considered. NIOSH should seek partnerships with stakeholders in the private sector as well.

ABBREVIATIONS

APHA	American Public Health Association
BLS	Bureau of Labor Statistics
CDC	Centers for Disease Control and Prevention
CFOI	Census of Fatal Occupational Injuries
CPS	Current Population Survey
CSREES	Cooperative State Research, Education, and Extension Service
DHHS	U.S. Department of Health and Human Services
DOL	U.S. Department of Labor
DRDS	Division of Respiratory Disease Studies
DSHEFS	Division of Surveillance, Hazard Evaluations, and Field Studies
DSR	Division of Safety Research
EID	Education and Information Division
EPA	U.S. Environmental Protection Agency
FACE	Fatality Assessment and Control Evaluation Program
FLSA	Fair Labor Standards Act
HOs	Hazardous Occupations Orders
IMIS	Integrated Management Information System
NCHS	National Center for Health Statistics
NEISS	National Electronic Injury Surveillance System
NIOSH	National Institute for Occupational Safety and Health
NTOF	National Traumatic Occupational Fatalities Surveillance System
OD	Office of the Director
OSHA	Occupational Safety and Health Administration
SENSOR	Sentinel Event Notification System for Occupational Risks
SOII	Survey of Occupational Injuries and Illnesses

ACKNOWLEDGMENTS

The Team thanks all those who attended and gave expert presentations at Team meetings (Appendix C). The presentations and input from these experts greatly increased Team knowledge and appreciation of the complex issues surrounding youth employment. Special thanks go to several individuals who provided expertise on occupational safety and health concerns for children and adolescents on a regular basis: Letitia Davis, Sc.D., Massachusetts Department of Public Health; David Parker, M.D., M.P.H., Minnesota Department of Health; Suzanne Mager, J.D., and Mary Miller, Washington Department of Labor and Industries; and Chaya Piotrkowski, Fordham University. These individuals are all actively involved in the occupational safety and health of adolescents and were extremely generous in sharing their expertise with the Team. The Team also thanks our supervisors and the National Institute for Occupational Safety and Health (NIOSH) Leadership Team for their support and commitment to our efforts at providing an informed response to the occupational safety and health research needs of working children and adolescents.

1 INTRODUCTION

THE National Institute for Occupational Safety and Health (NIOSH) Child Labor Working Team was formed in April 1994 by Dr. Richard Lemen, the former Deputy Director of NIOSH. In his Charge to the Team (Appendix A), Dr. Lemen stated that “NIOSH must take an active role in the prevention of work-related injuries and illnesses among our Nation’s youth.” The mandate for the Team was to assess current research and prevention activities “with the goal of identifying research, surveillance, and intervention actions to be undertaken for the prevention of injuries and illnesses that limit the health, well-being, or potential of our working youth in this country.”

This *Special Hazard Review* identifies the research needs identified by the Team as of July 1996. The document synthesizes available data and identifies research needs and opportunities for prevention.

Scope

The research recommendations in this *Special Hazard Review* cover the full research spectrum—from surveillance through etiologic and intervention research. Considerations of the occupational safety and health of children and adolescents cannot be restricted to the work environment. School, family, and extracurricular activities all influence the safety and health of working children and adolescents. Furthermore, many nonworking children are routinely exposed to hazardous work environments. Consequently, the foci for research and intervention must be diverse.

In identifying research needs, the Team addressed both the formal and informal employ-

ment of children—for example, children employed informally in family farming and fishing operations. The Team also addressed school-based or -facilitated work programs (such as vocational and school-to-work programs) and children exposed to occupational hazards in their living environments or in their parents’ workplaces (some children accompany their parents at work). The Team identified special populations that have specific research or intervention needs: youths with learning disabilities, minority and disadvantaged youths, school drop-outs, and children who accompany their parents at work (e.g., migrant and nonmigrant children on farms, and children of immigrants working in sweatshops). Two areas of child labor that the Team acknowledges to be important are not addressed in this report: international child labor and the illicit employment of children in operations such as drug sales, prostitution, and door-to-door sales.

Approach

The identification of research needs was shaped by the following complementary goals:

- To reduce injuries and illnesses resulting from childhood exposures to hazardous work environments
- To promote positive, encouraging, successful, and healthy introductions to working life
- To foster knowledge and skills in safety and health that will remain with youths throughout their working lives

and enable them to be active participants in shaping their work environments

The Team identified research needs by drawing on (1) the diverse expertise of Team members (Appendix B), (2) research conducted by Team members, and (3) presentations and input from outside experts (Appendix C). The Team explored the following issues: available data, regulatory approaches, school-based and -facilitated work experience and education,

psychosocial aspects of youth employment, issues in agriculture, and perceived research needs of various stakeholders actively involved in youth occupational safety and health issues. All potential stakeholders should be involved to ensure innovative, comprehensive, coordinated approaches to the occupational safety and health of young workers. Future Team efforts will maintain stakeholder involvement as a goal.

2 BACKGROUND

Historical Issues

HISTORICALLY, regulation of child labor has been motivated by both economic issues and concerns for the safety, health, and normal development of children. In the early part of this century, children were viewed as a potential source of cheap labor who competed with adults for jobs at the cost of their health and education. Early efforts to regulate child labor were made at the State and national levels, but early Federal legislation was challenged in the courts and ruled to be unconstitutional. In 1938, passage of the Fair Labor Standards Act (FLSA) provided the basis for regulating child labor at the Federal level. The FLSA, as amended [29 USC* Ch. 8 §201–219], is still the basic Federal statute dealing with child labor.

The growth of child labor in recent decades again threatens to interfere with education and poses threats to the safety and health of children. Before 1945, it was unusual for children to work while attending school; but by the 1980s, about one third of students held jobs during the academic year. The workplace has become an important factor in adolescent development.

Data on Youth Employment

Limited information is available at the national level for characterizing youth employment and calculating rates of injuries and illnesses. The Current Population Survey (CPS) conducted

for the Bureau of Labor Statistics (BLS) is a monthly survey of U.S. households selected from a probability sample of the civilian non-institutionalized population. In 1995, an estimated 2.6 million (35%) of the Nation's adolescents aged 16 and 17 were employed [BLS 1996]. Comparisons of employment data from the CPS and longitudinal surveys suggest that the CPS underestimates youth employment [GAO 1991]. One reason may be their use of proxy respondents. Because data are not routinely collected for youths aged 14 and younger, it is not possible to estimate the number of the Nation's youngest workers and, consequently, their rates of injury and illness. High school surveys suggest that about 80% of students are employed at some time during their high school years [Steinberg and Cauffman 1995]. Data suggest that in 1975, the United States had twice the proportion of children under age 15 in the workforce as other industrial countries [Richter and Jacobs 1991].

Data from the 1990 Census indicate that most youths worked in the retail trades—especially restaurants and grocery stores [Children's Safety Network 1995] (see Figure 1). CPS data indicate that 87% of employed adolescents aged 16 and 17 worked part time (34 hr or less per week) in 1995. Data from the 1990 Census showed that adolescents aged 16 and 17 worked an average of 24 hr per week for 25 weeks of the year in 1989 [Children's Safety Network 1995]. Longitudinal surveys demonstrate that brief periods of employment are common among young workers [BLS 1992]. Steinberg and Cauffman [1995] confirmed this observation for workers under age 18.

**United States Code.*

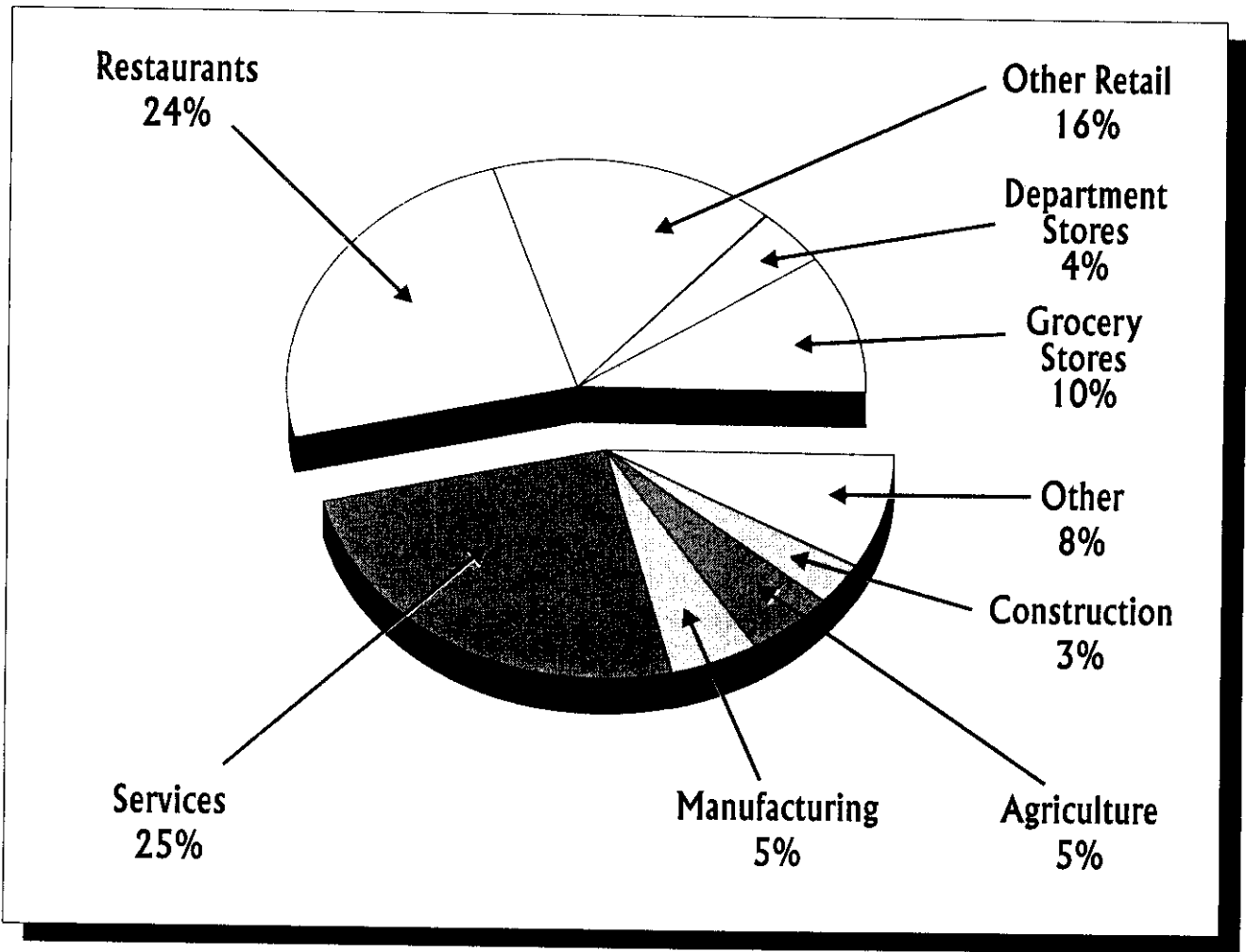


Figure 1. Types of jobs held by youths in 1990. (Data from Children's Safety Network [1995].)

Because youth employment data are frequently difficult to access at the State level, research within States and comparisons across States are hampered. State-specific employment data from the CPS are published using the group aged 16 to 19 [BLS 1995a], though analyses for youths under age 18 are possible within individual States [Belville et al. 1993]. Decennial census data can be analyzed at the State level [Brooks and Davis 1996; Miller 1995; Banco et al. 1992]; but they may not correspond with the years of injury and illness data, and they may require the assumption that youth employment is stable over time. A survey of teens was used to estimate employment in one State [Parker et al. 1994a]. One group calculated injury and illness rates based on issued child labor documents [State of Wyoming 1984], and another reported rates per capita [Brooks et al. 1993]. Others have reported State-specific injury and illness data without calculating rates based on employment data [Cooper and Rothstein 1995; Bush and Baker 1994; Heyer et al. 1992].

When examining employment patterns of children under age 18, it is important to recognize that work is frequently in addition to school attendance. Thus working 20 hr per week during the school year approximates a 50-hr work-week, not considering homework or extracurricular activities. Youth employment is clustered in occupations that mirror the emerging workforce. Service workers are projected to become the largest group of workers in the near future [Silvestri 1994], and temporary or part-time jobs are increasingly common [NIOSH 1996b]. Most youths work part time, and many work in service occupations. Occupational safety and health issues in working children may highlight issues that will arise as the Nation's workforce is transformed.

Occupational Injury and Illness Data for Youths

Fatal Injuries

National-Level Analyses

Several national-level sources of data exist for fatal work injuries among children under age 18:

- The Integrated Management Information System (IMIS), which includes data from fatality investigations by the Occupational Safety and Health Administration (OSHA)
- The National Traumatic Occupational Fatalities (NTOF) Surveillance System, based on death certificates for workers aged 16 and older
- The Census of Fatal Occupational Injuries (CFOI), a national multisource database
- The Fatality Assessment and Control Evaluation (FACE) Program, which investigates causes of work-related deaths in participating States

The IMIS database included 104 deaths of children under age 18 for the years 1984-87 [Suruda and Halperin 1991]. Citations for safety violations were issued in 70% of these deaths, and 41% of the deaths involved work prohibited by Federal child labor laws. Fourteen of the 104 deaths were of children under age 15. These figures do not represent all work-related deaths of children during this period, since OSHA fatality investigations are concentrated in construction and manufacturing, and OSHA does not investigate transportation- or violence-related deaths.

The NTOF Surveillance System reports 784 deaths of adolescents aged 16 and 17 for the period 1980–92 [NIOSH 1997]. This figure is a conservative count of work-related fatalities of children during this period because death certificates alone identify only about 80% of work-related deaths, and the NTOF Surveillance System does not include workers under age 16 [Castillo et al. 1994]. The leading causes of death were incidents involving motor vehicles, machines, electrocution, and homicide. The fatality rate for adolescents aged 16 and 17 was 5.1 per 100,000 full-time equivalent workers for the 10-year period 1980–89 [Castillo et al. 1994]. The rate for adults aged 18 and older was 6.1. This relatively small difference in rates is cause for concern because youths under age 18 are employed less frequently in especially hazardous jobs.

The CFOI identified 67 to 68 work-related deaths of children under age 18 each year from 1992 to 1994 [Toscano and Windau 1994, 1995; Derstine 1994]. In 1994, 25 deaths of workers under age 16 and 42 deaths of workers aged 16 and 17 occurred [Toscano and Windau 1995]. Agricultural business and retail trades accounted for the most deaths [NIOSH 1995; Derstine 1994]. Many of the deaths of adolescents occurred in family businesses. Highway events accounted for the most deaths: 20% of the deaths of youths under age 16 and 26% of the deaths of adolescents aged 16 and 17. CFOI data suggest that homicide accounts for a larger proportion of the deaths of working adolescents than indicated by NTOF for the 1980s. Homicide accounted for 10% of the occupational injury deaths of adolescents aged 16 and 17 during 1980–89 [Castillo et al. 1994] compared with 28% in 1993 [Toscano and Windau 1994]. Because of differences between the NTOF and CFOI systems, it is not possible to determine whether the incidence of homicide has increased in the 1990s or

whether homicides of youths were underreported in NTOF during the 1980s.

State-Level Analyses

The NTOF Surveillance System includes occupational injury deaths for adolescents by State (see Table 1). The FACE Program has two components: an in-house component (in which NIOSH staff investigate certain causes of death in West Virginia and five surrounding States) and a program in which 14 cooperating States enumerate all work-related fatalities in their States and investigate certain causes of death. The in-house FACE program investigated three electrocutions of children under age 18 between 1986 and 1989 [NIOSH 1986a,b; 1988]. The State FACE Program has identified 67 work-related deaths of children under age 18 since 1989 [NIOSH 1996a]. Because States entered the FACE Program at varying times since 1989, these figures do not represent all work-related deaths of youths in FACE States during this period. Investigations have been conducted for 12 deaths, including events related to machinery, motor vehicles, and falls.

Comprehensive information from FACE investigations has been very informative. An investigation by the Iowa FACE Program is a good example [Iowa FACE Program 1995]. A 12-year-old boy, who was working part time for a farmer, died after he lost control and overturned a tractor in a roadside ditch. The investigation identified two factors that may have contributed to the incident: the distance from the seat to the brakes (which was too long for the boy) and the loader frame on the tractor (which may have obstructed the boy's view of the front wheels, making it difficult to see the exact position of the front wheel and the edge of the road). The farmer reported that the boy had read books on tractor safety and was a good student.

Table 1. Occupational injury deaths of U.S. adolescents aged 16 and 17, 1980–92, by State

State	Total number	Leading causes of death	
		Type	Number
Alabama	12	Electrocution	3
Alaska	7	*	—
Arizona	8	Motor-vehicle-related	3
Arkansas	11	Electrocution	5
		Motor-vehicle-related	3
California	81	Motor-vehicle-related	24
		Homicide	21
		Machine-related	13
Colorado	15	Motor-vehicle-related	7
Connecticut [†]	3	*	—
Delaware	‡	—	—
District of Columbia	‡	—	—
Florida	38	Motor-vehicle-related	9
		Machine-related	6
		Electrocution	5
Georgia	30	Motor-vehicle-related	8
		Falls	5
		Suffocation	4
Hawaii	‡	—	—
Idaho	9	Motor-vehicle-related	5
Illinois	38	Motor-vehicle-related	8
		Homicide	6

See footnotes at end of table.

(continued)

Table 1 (continued). Occupational injury deaths of U.S. Adolescents aged 16 and 17, 1980-92, by State

State	Total number	Leading causes of death	
		Type	Number
Indiana	14	Motor-vehicle-related	6
Iowa	13	Motor-vehicle-related	5
		Suffocation	3
Kansas	10	Motor-vehicle-related	3
Kentucky	9	*	—
Louisiana	14	Water-transport-related	5
Maine	5	Machine-related	3
Maryland	6	*	—
Massachusetts	11	Motor-vehicle-related	3
Michigan	17	Machine-related	7
Minnesota	13	Machine-related	4
Mississippi	19	Drowning	3
		Electrocution	3
		Falls	3
Missouri	13	Homicide	4
		Machine-related	3
Montana	3	*	—
Nebraska	8	Machine-related	3
Nevada	‡	—	—

See footnotes at end of table.

(continued)

**Table 1 (continued). Occupational injury deaths of U.S. Adolescents
aged 16 and 17, 1980–92, by State**

State	Total number	Leading causes of death	
		Type	Number
New Hampshire	3	*	—
New Jersey	9	*	—
New Mexico	5	*	—
New York [†]	24	Machine-related	7
		Motor-vehicle-related	4
North Carolina	20	Motor-vehicle-related	6
		Homicide	4
		Machine-related	3
North Dakota	‡	—	—
Ohio	22	Motor-vehicle-related	7
		Machine-related	4
		Electrocution	3
Oklahoma	21	Machine-related	6
		Electrocution	4
Oregon	19	Motor-vehicle-related	8
		Machine-related	4
		Electrocution	3
Pennsylvania	36	Motor-vehicle-related	12
		Machine-related	7
Rhode Island	‡	—	—
South Carolina	8	*	—

See footnotes at end of table.

(continued)

Table 1 (continued). Occupational injury deaths of U.S. Adolescents aged 16 and 17, 1980–92, by State

State	Total number	Leading causes of death	
		Type	Number
South Dakota	10	Machine-related	6
Tennessee	12	Electrocution	4
		Falls	3
		Motor-vehicle-related	3
Texas	100	Motor-vehicle-related	23
		Homicide	15
		Machine-related	14
Utah	13	*	—
Vermont	‡	—	—
Virginia	25	Motor-vehicle-related	8
Washington	7	Electrocution	3
West Virginia	9	Motor-vehicle-related	3
Wisconsin	18	Motor-vehicle-related	5
		Machine-related	4
Wyoming	4	*	—
TOTAL	784	—	—

Source: NTOF Surveillance System [NIOSH 1997].

*No single cause accounted for more than two deaths.

†Death certificates were not available from Connecticut and New York City, New York, for 1992.

‡NIOSH does not report data for States with fewer than three deaths.

Work-related fatalities of children have been examined in four States using workers' compensation data, death certificates, and medical examiner records [Cooper and Rothstein 1995; Miller 1995; Dunn and Runyan 1993; Belville et al. 1993]. In at least one of these States (North Carolina), the analyses spawned additional research and were considered in the promulgation of new State child labor regulations [University of North Carolina Injury Prevention Research Center 1995].

Nonfatal Injuries and Illnesses

National-Level Analyses

Nonfatal work-related injuries among children and adolescents have been analyzed at the national level using data from the Survey of Occupational Injuries and Illnesses (SOII) [CDC 1996b] and the National Electronic Injury Surveillance System (NEISS) [Layne et al. 1994]. The SOII is a BLS survey of approximately 250,000 private industry establishments in the United States [BLS 1995b]. Demographic and case information is available only for the most serious injuries (those resulting in at least 1 day away from work). The SOII excludes self-employed workers, farmers with fewer than 11 employees, private households, and government employees [BLS 1995b]. Employment data for workers aged 16 and 17 suggest that at least 11% of working children under age 18 are not represented by the SOII [CDC 1996b].

Nevertheless, the working children included in the 1993 SOII suffered an estimated 21,620 injuries and illnesses involving days away from work [CDC 1996b]. The median number of days away from work was 3. Injured and ill children under age 18 were most frequently employed in the following types of workplaces:

	<i>% total cases</i>
Eating and drinking places	39
Grocery stores	14
Nursing and personal care facilities.	6
Department stores	5

The most common events resulting in injury were as follows:

	<i>% total cases</i>
Falls on the same level (includes falls to floors and falls onto or against objects)	21
Injuries from overexertion (includes injuries from lifting, pulling, pushing, turning, wielding, holding, carrying, or throwing objects)	17
Striking against objects (includes bumping into, stepping on, kicking, and being pushed or thrown into or against objects)	10
Contact with hot objects	9
Being struck by falling objects	7
Being struck by a slipping handheld object (such as a knife, razor, or tool).	6

NEISS is a probability sample of 91 hospital emergency departments in the United States [Layne et al. 1994]. Previous research indicates that only one-third of work-related injuries are seen in emergency rooms [Ries 1978]. An estimated 64,000 adolescents aged 14 to 17 required treatment in hospital emergency rooms for work-related injuries in 1992 [Layne et al. 1994]. The rate of injury for workers aged 15 to 17 was estimated to be 5.8 per 100

full-time equivalent employees. Because the NEISS was limited to young workers in 1992, it was not possible to contrast the rates for adolescents to those of adults. In a previous surveillance effort in which data were collected for workers of all ages, rates for workers aged 16 and 17 were exceeded only by the rate for workers aged 18 and 19 [Coleman and Sanderson 1983]. Based on emergency department data, a study of all injuries to children in Massachusetts during the early 1980s suggests that work contributes substantially to adolescent injuries [Brooks et al. 1993]. Among adolescents aged 14 to 17, 7% to 13% of all injuries seen in the emergency department were attributed to work. Among adolescents aged 17, work injuries constituted 14% to 26% of all injuries seen in the emergency department.

Retail trades had both the highest frequency and rate of adolescent injuries treated in the emergency department [Layne et al. 1994]. Fifty-four percent of adolescent occupational injuries were attributed to work in retail trades, with a rate of 6.3 injuries per 100 full-time equivalent employees. Restaurants accounted for nearly three-fourths of these injuries in the retail trades.

The service industry sector had the next highest frequency of adolescent occupational injuries: nearly two-thirds of the injuries in the service industry occurred in health services, amusement and recreation, and educational services [Layne et al. 1994]. The most frequent types of injuries in adolescent workers were as follows:

	<i>% total cases</i>
Lacerations	35
Contusions	18
Sprains	16
Burns.	12
Fractures and dislocations	4
All other	15

Telephone interviews were conducted with adolescents aged 14 to 16 who were identified in the surveillance system within the first 3 months of surveillance [Knight et al. 1995]. Sixty-eight percent of these youths experienced limitations in their normal activities (including work, school, and play) for at least 1 day, and 25% experienced limitation in their normal activities for more than a week.

State-Level Analyses

Workers' compensation claims reported to the BLS Supplementary Data System were analyzed for injuries to children under age 18 in 24 States for the years 1980–83 [Schober et al. 1988]. Of the 23,823 claims reported, approximately 10% occurred in children under age 16. Workers' compensation data have also been reported for workers under age 18 in 8 States: Massachusetts [Brooks and Davis 1996], Texas [Cooper and Rothstein 1995], Washington [Miller 1995; Heyer et al. 1992], California [Bush and Baker 1994], Minnesota [Parker et al. 1994a], New York [Belville et al. 1993], Connecticut [Banco et al. 1992], and Wyoming [State of Wyoming 1984]. State-specific data from the SOII have been reported for the 42 States participating in the Federal/State cooperative agreement for 1993 [CDC 1996b] (Table 2), and analyses have been done using emergency department data [Brooks et al. 1993] and survey methodology [Parker et al. 1994b] in individual States.

Many State-specific studies duplicate the findings of national-level studies. Numerous studies have demonstrated that the number of work-related injuries increases with age through adolescence, with the greatest incidence among workers aged 17 [Brooks and Davis 1996; Cooper and Rothstein 1995; Toscano and Windau 1995; Miller 1995; Layne et al. 1994; Castillo et al. 1994; Belville et al. 1993; Brooks et al. 1993; Banco et al. 1992; Heyer et al. 1992; Suruda and Halperin 1991;

**Table 2. Work injuries and illnesses involving days away from work
for children under age 18, by State—42 States, 1993***

State[†]	Estimated frequency	Median days away from work	Frequent industries[‡] (% total cases)	Frequent events and exposures[§] (% total cases)
Alabama	330	6	Eating and drinking places (32%) Grocery stores (16%)	Fall on same level (23%) Overexertion in lifting (18%) Struck by object not elsewhere classified (12%)
Alaska	86	3	Laundry, cleaning, and garment services (17%) Grocery stores (16%) Misc. food prep. and kindred products (16%)**	Inhalation of caustic, noxious, or allergenic substances (17%) Struck against stationary object (16%)
Arizona	592	2	Eating and drinking places (71%)	Struck by object (37%) Fall on same level (19%)
Arkansas	238	6	Eating and drinking places (40%) Grocery stores (13%)	Fall on same level to floor, walkway, etc. (26%) Overexertion in lifting (16%) Contact with hot objects or substances (11%)
California	1,418	2	Eating and drinking places (30%) Social services (24%) ^{††}	Contact with hot objects or substances (21%) Bodily reaction and exertion, unspecified (13%) Bodily reaction (12%)
Connecticut	220	4	Grocery stores (33%) Eating and drinking places (28%)	Fall on same level (24%) Overexertion in lifting (11%)
Delaware	39	5	Eating and drinking places (46%)	Fall on same level to floor, walkway, etc. (20%) Overexertion in lifting (14%)

See footnotes at end of table.

(continued)

Table 2 (continued). Work injuries and illnesses involving days away from work for children under age 18, by State—42 States, 1993*

State[†]	Estimated frequency	Median days away from work	Frequent industries[‡] (% total cases)	Frequent events and exposures[§] (% total cases)
Florida	1,527	3	Eating and drinking places (34%) Grocery stores (23%) Misc. amusement and rec. services (13%) ^{††}	Fall on same level (27%) Overexertion (18%) Struck against object (12%)
Georgia	499	3	Eating and drinking places (42%) Grocery stores (16%)	Fall on same level to floor, walkway, etc. (30%) Contact with hot objects or substances (16%)
Hawaii	141	4	Construction—special trade contractors (22%) ^{§§}	Contact with hot objects or substances (33%) Overexertion (21%) Slip, trip, loss of balance—without fall (10%)
Indiana	706	3	Eating and drinking places (45%) Food stores (15%) Health services (14%)	Fall on same level (25%) Overexertion (18%) Contact with hot objects (16%)
Iowa	340	3	Eating and drinking places (47%) Grocery stores (13%) Nursing and personal care facilities (10%)	Struck by falling object (23%) Slip, trip, loss of balance—without fall (13%)
Kansas	225	3	Eating and drinking places (53%)	Overexertion (19%) Struck against stationary object (11%) Fall on same level to floor, walkway, etc. (10%)
Kentucky	490	3	Eating and drinking places (54%)	Fall on same level to floor, walkway, etc. (25%) Contact with hot objects or substances (15%) Overexertion (10%)

See footnotes at end of table.

(continued)

Table 2 (continued). Work injuries and illnesses involving days away from work for children under age 18, by State—42 States, 1993*

State[†]	Estimated frequency	Median days away from work	Frequent industries[‡] (% total cases)	Frequent events and exposures[§] (% total cases)
Louisiana	175	4	Grocery stores (37%)	Fall on same level to floor, walkway, etc. (23%) Overexertion in lifting (23%) Struck by falling object (16%)
Maine	93	4	Grocery stores (37%)	Overexertion in lifting (30%) Struck against stationary object (16%) Caught in running equipment or machinery (12%)
Maryland	425	2	Eating and drinking places (50%)	Struck against object (24%) Struck by falling object (20%) Fall on same level to floor, walkway, etc. (17%)
Massachusetts	519	4	Eating and drinking places (32%) Grocery stores (22%) Department stores (10%)	Overexertion in lifting (20%) Struck by slipping handheld object (10%)
Michigan	544	4	Department stores (14%) Grocery stores (10%)	Struck against stationary object (25%) Overexertion (13%) Fall on same level (11%)
Minnesota	336	4	Grocery stores (19%) Nursing and personal care facilities (11%)	Fall on same level (11%)
Mississippi	227	3	Eating and drinking places (43%) Grocery stores (16%)	Contact with hot objects or substances (18%) Fall on same level to floor, walkway, etc. (15%) Struck by slipping handheld object (14%)

See footnotes at end of table.

(continued)

Table 2 (continued). Work injuries and illnesses involving days away from work for children under age 18, by State—42 States, 1993*

State[†]	Estimated frequency	Median days away from work	Frequent industries[‡] (% total cases)	Frequent events and exposures[§] (% total cases)
Missouri	615	5	Eating and drinking places (53%) Grocery stores (12%)	Fall on same level (21%) Struck against stationary object (17%) Slip, trip, loss of balance—without fall (11%)
Montana	84	4	General merchandise stores (12%)	Skin contact with caustic, noxious, or allergenic substances (22%) Slip, trip, loss of balance—without fall (13%) Overexertion in pulling or pushing objects (12%)
Nebraska	440	1	Wholesale groceries and related products (10%)	Struck by falling object (65%) Exposure to caustic, noxious, or allergenic substances (11%)
Nevada	159	5	Eating and drinking places (27%) Hotels and motels (31%) Misc. amusement and rec. services (12%) ^{††}	Inhalation of caustic, noxious, or allergenic substances (23%) Fall on same level to floor, walkway, etc. (19%) Slip, trip, loss of balance—without fall (12%)
New Jersey	248	3	Grocery stores (27%)	Fall on same level (28%) Overexertion in lifting (16%) Caught in running equipment or machinery (13%)
New Mexico	231	2	Eating and drinking places (58%) Grocery stores (18%)	Skin contact with caustic, noxious, or allergenic substances (20%) Overexertion not elsewhere classified (18%) Fall on same level to floor, walkway, etc. (14%)

See footnotes at end of table.

(continued)

Table 2 (continued). Work injuries and illnesses involving days away from work for children under age 18, by State—42 States, 1993*

State [†]	Estimated frequency	Median days away from work	Frequent industries [‡] (% total cases)	Frequent events and exposures [§] (% total cases)
New York	1,060	6	Eating and drinking places (34%) Grocery stores (32%) Hospitals (10%)	Caught in or compressed by equipment or object (15%) Contact with hot objects or substances (13%) Fall on same level (13%)
North Carolina	947	3	Eating and drinking places (51%) Grocery stores (11%)	Fall on same level (29%) Struck against stationary object (13%) Overexertion in lifting (10%)
Oklahoma	383	4	Eating and drinking places (60%) Grocery stores (13%)	Fall on same level to floor, walkway, etc. (22%) Contact with hot objects or substances (20%) Overexertion in lifting (14%)
Oregon	410	2	Eating and drinking places (57%)	Struck by slipping handheld object (30%) Struck against object (19%) Slip, trip, loss of balance—without fall (10%)
Pennsylvania	719	3	Eating and drinking places (27%) Grocery stores (16%)	Fall on same level to floor, walkway, etc. (25%) Overexertion in lifting (13%) Struck by slipping handheld object (10%)
Rhode Island	158	2	Eating and drinking places (53%)	Fall on same level to floor, walkway, etc. (31%) Contact with hot objects or substances (24%) Struck by swinging or slipping objects (16%)
South Carolina	234	2	Grocery stores (29%) Misc. amusement and rec. services (15%) ^{††}	Fall on same level to floor, walkway, etc. (21%) Overexertion in lifting (11%) Struck by swinging or slipping objects (10%)

See footnotes at end of table.

(continued)

Table 2 (continued). Work injuries and illnesses involving days away from work for children under age 18, by State—42 States, 1993*

State [†]	Estimated frequency	Median days away from work	Frequent industries [‡] (% total cases)	Frequent events and exposures [§] (% total cases)
Tennessee	859	4	Eating and drinking places (62%)	Fall on same level (23%) Contact with hot objects or substances (22%) Overexertion in lifting (16%)
Texas	992	3	Eating and drinking places (46%) Grocery stores (19%)	Fall on same level to floor, walkway, etc. (21%) Overexertion (21%) Struck by slipping handheld object (11%)
Utah	303	3	Grocery stores (14%) Hotels and motels (11%)	Fall on same level (29%) Struck against stationary object (12%) Contact with hot objects or substances (11%)
Vermont	24	1	Hotels and motels (27%)	Fall on same level to floor, walkway, etc. (27%) Exposure to sun (22%) Struck by slipping handheld object (21%)
Virginia	686	3	Eating and drinking places (39%)	Overexertion (28%) Struck by falling object (14%) Fall on same level to floor, walkway, etc. (11%)
Washington	361	2	Eating and drinking places (62%) Grocery stores (17%)	Struck against object (27%) Fall on same level (21%) Overexertion in lifting (17%)
Wisconsin	435	4	Eating and drinking places (37%)	Fall on same level to floor, walkway, etc. (18%) Overexertion in lifting (14%) Contact with hot objects or substances (13%)

See footnotes at end of table.

(continued)

Table 2 (continued). Work injuries and illnesses involving days away from work for children under age 18, by State—42 States, 1993*

State[†]	Estimated frequency	Median days away from work	Frequent industries[‡] (% total cases)	Frequent events and exposures[§] (% total cases)
Wyoming	43	6	General merchandise stores (17%)	Fall through roof surface (28%) Contact with hot objects or substances (14%) Skin contact with caustic, noxious, or allergenic substances (14%)

*Data are from the Survey of Occupational Injuries and Illnesses, Bureau of Labor Statistics, U.S. Department of Labor.

[†]Data are not available from Colorado, the District of Columbia, Idaho, Illinois, New Hampshire, North Dakota, Ohio, South Dakota, and West Virginia because the samples in these States were not designed to generate State-specific estimates.

[‡]Office of Management and Budget. Standard Industrial Classification Manual 1987. Washington DC: US Government Printing Office, 1982. This is a hierarchical coding structure; both specific and collapsed codes are presented in the table, depending on the available data for each State. Top three industries accounting for at least 10% each of cases are reported.

[§]Bureau of Labor Statistics. Occupational Injury and Illness Classification Structures 1992: Code Descriptions. Washington, DC: U.S. Department of Labor. This is a hierarchical coding structure; both specific and collapsed codes are presented in the table, depending on the available data for each State. Top three events accounting for at least 10% each of cases are reported.

**Includes the manufacture of the following products: canned and cured fish and seafoods; prepared fresh or frozen fish and seafoods; roasted coffee; potato chips, corn chips, and similar snacks; manufactured ice; macaroni, spaghetti, vermicelli, and noodles.

^{††}Includes establishments providing social services and rehabilitation services to those persons with social or personal problems requiring special services and to the handicapped and the disadvantaged, including job training and vocational rehabilitation services.

^{‡‡}Includes the following services: physical fitness facilities; public golf courses; coin-operated amusement devices; amusement parks; membership sports and recreation clubs etc.

^{§§}Includes special trade contractors who undertake activities of a type that are specialized either to building construction, or to both building and nonbuilding projects. These activities include painting, electrical work, carpentry work, plumbing, heating, air-conditioning, roofing, and sheet metal work.

Schober et al. 1988; State of Wyoming 1984]. With one exception [Parker et al. 1994b], studies calculating injury rates by individual year of age have found increasing rates with age through adolescence [Layne et al. 1994; Belville et al. 1993; Brooks et al. 1993; State of Wyoming 1984]. Males consistently experience greater numbers and rates of injury [CDC 1996b; Brooks and Davis 1996; Cooper and Rothstein 1995; Miller 1995; Parker et al. 1994a; Layne et al. 1994; Castillo et al. 1994; Parker et al. 1994b; Belville et al. 1993; Brooks et al. 1993; Dunn and Runyan 1993; Banco et al. 1992; Suruda and Halperin 1991; Schober et al. 1988]. Many studies indicate that retail trades have large numbers and relatively high rates of injury among workers under age 18 [CDC 1996b; Brooks and Davis 1996; NIOSH 1995; Miller 1995; Layne et al. 1994; Castillo et al. 1994; Bush and Baker 1994; Belville et al. 1993; Banco et al. 1992; Schober et al. 1988; State of Wyoming 1984]. Lacerations, sprains and strains, contusions, and burns are among the most common nonfatal injuries in young workers [CDC 1996b; Brooks and Davis 1996; Miller 1995; Parker et al. 1994a; Layne et al. 1994; Parker et al. 1994b; Bush and Baker 1994; Belville et al. 1993; Brooks et al. 1993; Banco et al. 1992; Schober et al. 1988; State of Wyoming 1984].

Adolescent sprains and strains to the back are of particular concern. In Minnesota, 73% of all sprains and strains were to the low- and mid-back [Parker et al. 1994a]. In these analyses, sprains and strains were the most common cause of severe occupational injury, and 39% of severe injuries (61 of 157) were to the back. Of the severe back injuries, 21% (13 of 61) were to the lumbar disc. Back sprains and strains accounted for 15% of all workers' compensated injuries among adolescents in Massachusetts [Brooks and Davis 1996]. Back pain is atypical in adolescence [Kelsey and Golden 1987], and first episodes of back pain are

unusual before age 20. A history of back pain has been identified as a risk factor for new back injuries in two studies [Mitchell et al. 1994; Venning et al. 1987].

State-specific analyses are important for illustrating the magnitude of the problem in each State and targeting prevention efforts. Some States report considerable numbers and rates of injury for young workers in industries not otherwise prominent in the national statistics. Examples are manufacturing and construction in Massachusetts, Washington, and New York; public administration in Washington and Connecticut; and agriculture in Washington and New York [Brooks and Davis 1996; Miller 1995; Belville et al. 1993; Banco et al. 1992].

State-specific research holds potential beyond developing an industry profile of adolescent work injuries in each State. For example, analysis by residence in Massachusetts indicated that rates were highest in the southeast region of the State [Brooks and Davis 1996]. This area was selected for an innovative, community-based intervention (supported by NIOSH) to enhance young workers' occupational safety and health [Child Labor Coalition 1995]. Because findings indicated that more than one-third of lacerations in Connecticut were associated with the use of case-cutters, researchers suggested prevention strategies targeted at this instrument [Banco et al. 1992]. State-specific analyses have also provided unique findings not available from other studies. For example, survey data in Minnesota suggested that back injuries were more common in smaller workers and were positively associated with the amount of weight lifted [Parker et al. 1994a]. Investigations of burn events in Colorado and Minnesota and analysis of survey data led to recommendations for preventing serious burn injuries in restaurants, which are common among adolescents [Heinzman et al. 1993].

Data gathered on both the national and State levels document that occupational injuries among adolescents are frequent and severe and that better efforts are needed to protect working children. The data can also be used to target prevention efforts. The statistics are still incomplete, however.

Limitations of the Surveillance Systems and the Data

Gaps in Surveillance Systems

Existing surveillance systems contain significant gaps. A very conservative estimate is that 11% of working youths are not represented by the SOII [CDC 1996b]. In addition, estimates from the SOII exclude injuries and illnesses not resulting in days away from work. Because children under age 18 frequently work part time, some injuries and illnesses may require limitations in activity that are not reflected in time away from work because the limitations coincide with normal days off from work. Work-related injuries treated outside emergency departments (estimated to be about two-thirds of work injuries) are not captured in the NEISS [Layne et al. 1994]. Although the intent of workers' compensation is to provide coverage for all workers, no State laws cover all forms of employment [U.S. Chamber of Commerce 1991]. Groups of workers who frequently are not covered under workers' compensation laws include employees in small businesses, farm laborers, domestic servants, and casual employees. Evidence also indicates that adolescents are less likely than adults to have their injuries documented in workers' compensation systems [Brooks and Davis 1996].

Unreliable Identification of Work-Relatedness

Surveillance systems depend on the reliable identification of work-relatedness. Coroners,

medical examiners, and health care providers may not consider work-relatedness in cases involving children. Work-relatedness may also be difficult to identify in informal employment situations such as family farming or family fishing operations. Identifying work-related injuries and illnesses is particularly difficult among migrant workers who travel from area to area and may not seek medical treatment or report injuries and illnesses to their employers. In addition, data systems do not include injuries to nonworking children that result from exposure to a hazardous work environment. Family farms, farms employing migrant laborers and their families, and sweatshops in the needle trades are only three examples of situations in which young children are routinely exposed to hazardous work environments.

Inadequate Documentation of Agricultural Injuries in Children

Agricultural injuries in children are not well documented in standard occupational injury surveillance systems. Yet in 1995, an estimated 132,000 children aged 16 and 17 were employed in agriculture [BLS 1996], an industry that consistently ranks among the most dangerous in the United States [NIOSH 1993]. In 1991, an estimated 923,000 children under age 15 resided on farms and ranches [Dacquel and Dahmann 1993]. Farm children are exposed daily to agricultural hazards and may be involved in work. Children of hired farm workers who do not live on farms may accompany their parents to work [National Committee for Childhood Agricultural Injury Prevention 1996]. Because of the unique characteristics of agricultural work, surveillance of and research into childhood agricultural injuries require unique methods. Most of the data on agricultural injuries in children are aged, and new surveillance must be implemented [Stallones and Gunderson 1994].

Occupational Illnesses in Young Workers

Most information about the health outcomes of youth employment deals with injuries, but illness may also result when children and adolescents are exposed to hazardous materials or working conditions. Youths may be exposed to pesticides during farm work or lawn care, benzene during work at gasoline stations, lead during auto body repair, asbestos and silica during construction and maintenance work, and loud noise during manufacturing, construction, and farm work [Committee on Environmental Health 1995; Pollack et al. 1990; NIOSH 1994; Broste et al. 1989]. For example, audiometric threshold testing of vocational agriculture students in Wisconsin revealed that 57% of students who lived and worked on a farm had noise-induced hearing loss compared with 33% of students having little or no farm exposure [Broste et al. 1989]. Exposures to hazardous materials and working conditions may result in immediate illness or illness that is not detected for months or years after exposure. In both cases, the association with work exposures may not be recognized.

Inadequate Knowledge about the Relative Risks of Jobs

The relative risks of different jobs and information about outcomes need to be clarified. Although the risk of injury has been assessed for industry groups, it has not been assessed for various types of work or machines. Such data could inform decisions about what is appropriate work for children.

Lack of Data on the Number and Cost of Disabling Injuries

Analysis of workers' compensation data in New York suggested that 44% of the compensated adolescents suffered permanent dis-

ability [Belville et al. 1993]. The number of working children and adolescents who sustain disabling injuries and illnesses, and the impact of these outcomes on their future productivity need to be quantified for the Nation and for individual States. The costs of work injuries and illnesses among youths and the payers of these costs need to be identified to understand the true extent of the problem.

Risk Factors Unique to Children and Adolescents

A maxim of pediatrics states that children are not little adults. Most biological systems in the human body do not mature until about the age of 18 [National Research Council 1993]. Although adolescents are more like adults than younger children, their bodies are still growing and maturing. Many differences in anatomy, physiology, and psychology distinguish them from adults. These differences may translate into unique risk factors for occupational injuries and illnesses.

Physical and Physiological Risk Factors

Size

Adolescents vary greatly in size. A lack of fit between machines and the physical dimensions and strength of children and adolescents may increase the risk for injury. For example, studies conducted by the Consumer Product Safety Commission found that certain ages, heights, and weights were associated with higher rates of injury during the use of ride-on mowers [CPSC 1993]:

- Operators aged 5 to 14 had higher injury rates than older adolescents and adults.
- Operators with heights of 60 in. or less had higher injury rates than taller persons.

- Operators weighing less than 125 lb or more than 199 lb had higher injury rates than operators of other weights.

The association of ride-on mower injuries with small body size raises concerns about the operation of ride-on mowers and other machinery by children aged 14 and 15. Growth charts suggest that more than 50% of girls aged 15 and 50% of boys aged 15 weigh less than 125 lb. Height is a smaller issue, since only 10% of girls aged 15 and less than 5% of boys fall below 60 in. [NCHS 1976].

Growth

Among military recruits in Israel, data demonstrated a decreased risk for stress fractures with each year of age above 17 [Milgrom et al. 1994]. These results suggest that adolescent bones may not have reached full structural maturity. Adolescence is characterized by a rapid growth rate, which is exceeded only by the growth rates during infancy and early childhood [National Research Council 1993]. Diminished coordination during periods of rapid growth could increase the risk for work injury.

Sleep Requirements

Sleep research has shown that the transition from the childhood to the adult sleep-wake cycle includes several distinct steps and requires several years to complete. The adult pattern of afternoon sleepiness is first seen in children about halfway through puberty [Carskadon et al. 1980]. Yet the adult pattern of a reduced need for sleep (8 hr per night) is not observed until sometime after age 18. Current laboratory research suggests that adolescents through age 18 (and perhaps older) require approximately 9 hr of sleep per night [Carskadon 1990]. However, cross-sectional surveys report an average of 7 hr of sleep per night for high school students with part-time jobs—particularly among

juniors and seniors working 20 to 30 hr per week [Carskadon 1989, 1990]. These data corroborate observations from high school teachers who report sleepy students, especially during early morning classes. Heavy part-time work schedules may result in inadequate sleep, fatigue, and increased risks for injuries while working or commuting.

Sleep research is rapidly unraveling a complex set of phenomena. The current indications are as follows:

- Episodes of early morning and mid-afternoon sleepiness in adolescents have a clear physiological basis.
- Rapidly growing adolescents require as much or more sleep than their younger peers.
- School, work, and social pressures combine to create a pattern of sleep deprivation and fatigue, particularly during the workweek, and particularly for students working 20+ hr per week.
- Cumulative sleep deprivation and fatigue may place adolescents at increased risk for work-related injuries and illnesses—as well as for unintentional sleep episodes while driving to or from work.

Susceptibility to Injuries and Illnesses

Body weight, surface area, and fat composition vary between younger and older adolescents [National Research Council 1993]. These physiological differences may result in different degrees of susceptibility to occupational exposures during different periods of adolescence.

Growth and maturation are not constant across organ systems [National Research Council 1993]. The thymus grows most rapidly, exceeding adult size during most of childhood and decreasing to adult size beginning at about age 13. The brain approaches full adult size at about age 4, though behavioral development occurs through adolescence. The kidneys, spleen, and ovaries all grow steadily from about 40% of adult organ weight at age 8 to 100% at age 17. The testes and uterus increase dramatically from about 10% of adult weight at age 8 to 100% at age 17. Damage to an immature organ or organ system may permanently prevent normal physical maturation, and organ systems may be more susceptible during rapid periods of growth [National Research Council 1993]. For example, atomic bomb survivors have demonstrated increased risk for breast cancer among those exposed under the age of 20 compared with those exposed at age 40 or after [Merke and Miller 1992].

Psychosocial Risk Factors

Psychological Factors

In addition to the physical and physiological changes noted above, children experience profound psychological changes as they mature. This psychological transition is often less visible than the physical one, requires more time to complete, and typically lags behind physical maturation. Thus psychological immaturity may be obscured by a relatively mature physical appearance in an adolescent. As a result, a young worker may be assigned to a task for which he or she is emotionally or cognitively unprepared. In addition, a young worker will not have adequate experience to judge his or her ability to complete an assignment safely.

The terms most often used to describe the psychological attributes of adolescence are poor judgment, sensation seeking, poor risk assessment, vulnerability to peer pressure, incom-

plete self-image, pressure to excel, need to prove independence and maturity, desire to conform, and (conversely) need to rebel. Although these attributes are relevant throughout the life span, adolescence is the time when the individual first encounters the possibility of making independent, adult decisions and experiencing adult consequences. Poor risk assessment combined with a tendency toward sensation seeking may lead to feelings of invulnerability while operating a motor vehicle. The natural desire to prove one's independence and skills as well as to help the family may cause a young adolescent to take on a task for which he or she is not equipped. Such impulses have often resulted in deaths and permanent injuries to children in tractor rollovers, grain bin entrapments, and equipment entanglements while working on the family farm. At least in agriculture, concerns about cognitive and emotional maturity as well as overall lack of experience have been added to the ergonomic concerns about young workers noted earlier [Aherin and Todd 1989; National Committee for Childhood Agricultural Injury Prevention 1996].

The literature about adolescent development and risk-taking centers on sexual behavior, the use of alcohol and other drugs, and the operation of motor vehicles—particularly in conjunction with the consumption of alcohol [e.g., Kidd and Holton 1993]. Sensation seeking has recently been shown to be a fairly complex (and even protective) phenomenon when examined in a context such as school sports [Smith et al. 1992]. However, the consequences of risky behaviors during adolescence are generally severe [e.g., Zuckerman and Duby 1985]. Two studies are currently under way to shed further light on risk-taking behavior in adolescence: the Youth Risk Behavioral Surveillance System conducted by the National Center for Chronic Disease Prevention and Health Promotion, and the Adolescent Health Study conducted by the University of

North Carolina. Neither study emphasizes occupational issues.

Lack of Work Experience

No easy method exists for summarizing the complex issues of psychological development during adolescence and the potential consequences for working adolescents. However, lack of work experience is a contributing factor in all of the issues examined above. Additional research is necessary to confirm this hypothesis, but this brief review indicates that general lack of work experience coupled with normal adolescent psychological development places adolescents at high risk of injury on the job.

Lack of Training and Supervision

Factors related to work organization—such as the amount of safety training and supervision—may increase the risk for work injuries and illnesses among children and adolescents. In a telephone survey of workers aged 14 to 16 with work injuries identified through the NEISS, 54% reported receiving no training in methods to prevent their injuries [Knight et al. 1995]. Classroom discussions with 180 students in California also found low levels of training about job safety [Bush and Baker 1994]. In the NEISS telephone survey, a supervisor was present at the time of injury in only about 20% of the cases [Knight et al. 1995]. To counteract the lack of work experience, work-related training and supervision for adolescents must be both developmentally appropriate to the task and sufficient to achieve mastery. Only when teens adequately appreciate their risks on the job will they begin to adopt self-directed, self-monitored, safe work practices.

Inappropriate Work Assignments

Inappropriate work assignments also contribute to deaths and injuries of young workers. In

the NEISS telephone survey, 19% of the respondents appeared to have been injured in jobs typically prohibited by Federal child labor laws for workers of their age [Knight et al. 1995]. Studies of work-related fatalities among minors have found that 38% to 86% of such fatalities occurred during work typically prohibited under Federal child labor laws [NIOSH 1995]. And as discussed earlier, 70% of the deaths of children investigated by OSHA involved safety violations [Suruda and Halperin 1991].

Summary

Children and adolescents are not little adults. In addition to physical differences, young workers have differences in psychology, cognitive abilities, and skills. A recent report about preventing childhood agricultural injuries called for “developmentally appropriate” guidelines for children’s agricultural work based on research findings, theories, and principles associated with psychological and physical development [National Committee for Childhood Agricultural Injury Prevention 1996]. The need for age-appropriate or developmentally appropriate standards for adolescent work applies to nonagricultural work as well.

Psychosocial Effects of Youth Employment

Research on the psychosocial effects of adolescent employment has focused primarily on part-time work during high school. Although some adolescents drop out of high school to work full time and many high school students work full time over summer breaks, the primary interest of researchers in adolescent development has been on work during the school term. The main issues raised by this research [e.g., Steinberg and Cauffman 1995] have been the many positive and negative consequences of part-time work in the context of secondary

education, extra-curricular activities, family, peer group activities, and work experience relevant to future jobs.

The context of discussions about occupational safety and health in adolescent workers is somewhat broader than for adult workers. Adolescent work experience has the potential for exerting an important influence on the continuum of education and training in which adolescents participate. The task is to encourage young workers to learn positive work values (including how to work safely) while fully protecting them from workplace hazards and organizational stressors.

Positive Effects of Part-Time Work

Some of the positive effects that have been cited for part-time work for adolescents (e.g., by Finch et al. [1997]) include the acquisition of basic work skills such as those needed to gain and keep a job and those needed to interact with coworkers, supervisors, and customers, (promptness, dependability, etc.). Longer-term career enhancement may accrue as well, but these effects are not well demonstrated and remain equivocal. Similarly, development of a personal identity as a worker as well as a high school student may enhance self-confidence and self-esteem.

As work-based learning programs become more widespread, specific connections between education and work-related training may become more apparent and may enhance the overall educational experience of both school and work. Meanwhile, it is probably more accurate to conclude that although some work experiences benefit the educational performance of some high school students, these benefits are not yet known to occur in a widespread or systematic fashion.

Some adolescents undoubtedly supplement limited family resources with their pay, but data suggest that most working adolescents use their wages for personal expenses and savings. Similarly some scholars reason that adolescents who are working cannot be involved in certain delinquent behaviors. Again, the evidence for these conclusions is equivocal.

Negative Effects of Part-Time Work

The two most salient and best documented negative effects of part-time work for *some* high school students are decreased school performance and increased use of alcohol. Decreased school performance has taken the form of declining grades and selection of classes that make few demands on the student. Substance abuse is not confined to alcohol, but increased alcohol use is the effect most clearly linked to part-time work during the school term, primarily because of the increased financial resources of working adolescents.

Other negative effects of part-time work include decreased participation in sports and other extracurricular activities and (as noted above earlier) a pattern of sleep deprivation that appears to be linked to the number of hours worked per week. In addition, student focus groups have identified harassment and fear of workplace violence as specific concerns of working adolescents [Duran and Miara 1995].

In summary, part-time work during the school term has both positive and negative outcomes for adolescent workers. The pattern of these outcomes and the net benefit or harm derived depends on the ability to schedule adolescent activities and achieve a balance that allows adequate time for school, sleep, and interaction with peers and family.

Needs and Opportunities for Education and Training

Health Education at the Community Level

Promoting the safe and healthful employment of children and adolescents requires health education efforts at the community level. Such an approach is appropriate when (1) a large population is at risk, (2) a large number of people and organizations within a community may have an impact on the problem, and (3) the community lacks information and skills to deal with the health problem. All three criteria are satisfied in the area of safety and health for young workers [Bush and Baker 1994]. Although limited impacts are often reported for health education efforts at the community level [COMMIT Research Group 1995; Luepker et al. 1994; Fortmann et al. 1993], these efforts indicate that the method should be refined, not abandoned [Susser 1995].

Educating and Training Primary Stakeholders

Using Community Groups

To maintain the safety and well-being of children and adolescents while they are at work, it is necessary to provide education and training in occupational safety and health to the primary stakeholders—children and adolescents as well as to their parents and employers (e.g., managers and front-line supervisors). One approach to providing occupational safety and health training is to use community groups such as the parent-teacher associations, chambers of commerce, Kiwanis, 4-H, Scouts, and FFA. These groups can provide information to the primary stakeholders and thereby foster awareness and recognition of the following:

- Health hazards in the workplace
- Safety hazards in the workplace
- Good work practices and interventions that will prevent or control exposures to hazards

Reaching Industry and Labor Groups

Another approach to disseminating safety and health information is to use outreach programs directed to primary stakeholders. Industry and labor groups need to be aware of specific concerns for young workers and prevention strategies that work. Violations of child labor laws are common and too frequently result in serious injury or death [Knight et al. 1995; Castillo et al. 1994; Dunn and Runyan 1993; Suruda and Halperin 1991; GAO 1990, 1991]. A survey of injured adolescents indicated that 54% had not received training in prevention of their injury, and only 20% had a supervisor present at the time of the injury [Knight et al. 1995]. Employers need to know and comply with child labor laws, provide a safe and healthful work environment, ensure that adolescents recognize hazards and are competent in safe work practices, and provide appropriate supervision. Occupational safety and health information must be communicated not only to owners and managers but also to front-line supervisors who deal directly with young workers on a daily basis.

Tapping into the Educational System

Educators.—Educators play a role in the occupational safety and health of children and adolescents by approving work permits, preparing students for the world of work, and providing or facilitating work experience. School staff who sign work permits should be familiar with child labor laws and not sign off on work that is prohibited for minors.

Vocational education programs.—Vocational education courses are included in many secondary schools to provide students with marketable job skills. Vocational education courses are more commonly taken by students with disabilities (both physical and psychosocial) than by students without disabilities [Blackorby 1993]. An estimated 99% of students with disabilities took at least one vocational course in high school, and students with learning disabilities were most likely to take four or more related vocational courses [Wagner and Blackorby 1996]. Vocational education is considered a successful intervention for students with disabilities, as it is strongly associated with subsequent employment and higher earnings [Terman et al. 1996]. A safe and healthful environment for developing vocational skills along with knowledge and skills in safe work practices should be (but is not always) an integral component of vocational education programs. State departments of education were surveyed regarding required occupational safety and health education in high school agriculture classes [Ehlers 1992]. Of the 43 respondents, 14% had requirements in eye safety only, and 19% had no requirements. Serious injuries associated with vocational training classes have been reported to the Massachusetts Occupational Safety and Health Program [Massachusetts SENSOR Program 1993, 1995]. A case investigated by the Massachusetts program involved a student who lost his right arm and part of his scalp while working on a lathe at school [Massachusetts SENSOR Program 1995]. NIOSH researchers recently took part in an industrial hygiene survey of a vocational school and found unsafe conditions, including exposure to high noise levels and hazardous dusts and metals [Fajen et al. 1996].

School-to-work initiative.—In May 1994, President Clinton signed into law the School-to-Work Opportunities Act (Public Law

103-239). This and other work-based learning initiatives aim to prepare students for the world of work by providing integrated school- and work-based instruction in “all aspects of the industry.” The Act intends to provide this instruction to all students, not just to those who are in vocational programs or do not plan to go to college. Occupational safety and health is included in the definition of “all aspects of the industry.” The school-to-work initiative holds tremendous potential for providing our future workforce with knowledge and skills in hazard recognition and remediation, safe work practices, and workers’ rights and responsibilities. Since this initiative will increase exposure of young people to work and work environments, it is paramount that these work experiences not threaten the safety and health of our youths. Experts in occupational safety and health need to pursue involvement in school-to-work programs to ensure that we produce a future workforce skilled in occupational safety and health and free of the specter of increased injuries resulting from increased exposures.

Health education in schools.—Education in occupational safety and health also dovetails with comprehensive school health efforts. Comprehensive school health comprises eight interrelated components, including health education, a healthy school environment, staff health promotion, and parent and community involvement [Allensworth and Kolbe 1987]. The rationale for including health education in the school environment is that many unhealthy behaviors that result in substantial morbidity and mortality begin in youth. Work is a reality for many students, and most students will work at some point in their adult lives. The workplace frequently poses serious hazards to safety and health. Education in the ability to recognize and control hazards should be considered a critical life skill and incorporated into the educational system. Researchers in California used interviews, discussion sessions, and focus groups to solicit views from high

school teachers about educational needs and opportunities [Bush and Baker 1994]. All the instructors agreed that students needed to be educated in workplace safety and health and that schools were an appropriate place for this education.

Educating and Training Secondary Stakeholders

The numerous secondary stakeholders (e.g., *child safety advocates, equipment manufacturers, insurers, and policy makers*) need to be made more aware of occupational safety and health issues for children and adolescents. Childhood injury prevention advocates and professionals often fail to recognize that workplace hazards pose injury threats to children and adolescents. Information about workplace hazards could be incorporated into their prevention and research activities. Medical providers who sign work permits need to know child labor laws and ensure that they do not

sign off on work that is prohibited for minors. Medical providers can also take work histories to assess the role of work in injuries and illnesses of children and adolescents; in addition, they can deliver preventive messages about workplace hazards during routine visits. Manufacturers should design equipment that will protect young workers who are small or lack skills. Manufacturers should also clearly label equipment that is not appropriate for use by children and adolescents. Insurers may be able to provide financial incentives to employers who provide job safety training to young workers and exclude them from prohibited activities. In addition to providing jobs for out-of-school and disadvantaged youths, job programs should work to provide the knowledge and skills that will keep young workers safe and healthy. Policy makers require state-of-the-art knowledge about occupational safety and health issues to inform their decisions about workforce development and child labor regulations.

3 APPLICABLE REGULATIONS

OSHA Regulations

OSHA strives to make the workplace safe for everyone, regardless of age. The agency uses a 45-year working life (occurring between ages 21 and 65) as standard and, with one exception, does not differentiate on the basis of age. The only age-specific OSHA regulation concerns exposure to ionizing radiation [29 CFR* 1910.96(b)(3)].

Federal Child Labor Laws

The child labor provisions of the FLSA [29 USC Ch. 8 §201–219] were enacted to protect the educational opportunities of minors and prohibit their employment in jobs and under conditions detrimental to their health or well-being. The provisions include restrictions on both occupations and hours of work for minors under age 16; they prohibit all minors under age 18 from performing work within the non-agricultural hazardous occupations orders (HOs)—jobs declared by the U.S. Secretary of Labor as too dangerous for minors to perform. The regulations also provide for the enforcement of the child labor provisions and fines of up to \$10,000 per violation [29 CFR 570, 579, and 580].

The FLSA applies to minors engaged in interstate commerce, the production of goods for interstate commerce, or activities closely related and directly essential to such commerce.

The Act also applies to minors employed in certain enterprises covered by the Act. The

courts generally interpret the coverage of the Act broadly and its exemptions narrowly because of the remedial purposes of the law. However, not all minors are covered by Federal child labor laws. By statute, the Federal child labor provisions do not apply to the following:

- Youths under age 16 employed by their parents in occupations other than manufacturing or mining, or in occupations declared hazardous by the U.S. Secretary of Labor (however, children employed in agriculture may perform any work on farms owned or operated by their parents)
- Youths under age 18 employed as actors or performers in motion pictures or in theatrical, radio, or television productions
- Youths under age 18 engaged in the delivery of newspapers to the consumer
- Homeworkers under age 18 who make wreaths composed principally of natural holly, pine, cedar, or other evergreens (including the harvesting of the evergreens)

Additional exemptions have been created by regulation. Professional sports attendants who are aged 14 and 15 and perform traditional sports attendant duties outside of school hours are exempt from the hours standards of Child Labor Regulation No. 3 under the FLSA. The Work Experience and Career Exploration Program is an exception to the hours standards of child labor regulations. This program also allows the Wage and Hour Administrator to

**Code of Federal Regulations*. See CFR in references.

grant variances that permit enrollees to be employed in otherwise prohibited occupations—but not in manufacturing, mining, or the other 17 HOs. The Work Experience and Career Exploration Program is designed to provide a carefully planned work experience and career exploration program for youths aged 14 and 15 who can benefit from a career-oriented educational program designed especially to meet the participants' needs, interests, and abilities. Exemptions from certain HOs apply to apprentices and students enrolled in vocational education programs under conditions that assure safe, well supervised employment.

Although agricultural employment can be extremely hazardous, the Federal child labor provisions for farm work still reflect the bucolic ideology often described as the "agrarian myth" [Kelsey 1994]. Coverage is limited and protections are few for young farm workers. Hazardous work in nonagricultural industries is prohibited for youths under age 18. But in agriculture, hazardous work is prohibited only for youths under age 16 who are formally employed away from the family farm. As mentioned, the child labor provisions contain a statutory exemption that permits the children of farmers to perform any job on a family farm.

The U.S. Department of Labor (DOL) conducted a comprehensive review of the nonagricultural child labor regulations to consider significant social, economic, and technological changes that have occurred in the workplace during the past decade. As part of this review, DOL published an Advanced Notice of Proposed Rulemaking in 1994 [59 Fed. Reg.† 25164 (1994)]. NIOSH submitted comments on the Proposed Rulemaking [NIOSH 1994] and hopes that some revised Regulations will be issued in 1997.

†*Federal Register*. See Fed. Reg. in references.

Several bills are being considered by Congress this year to limit the enforcement of Hazardous Occupations Order Number 2 (HO 2) (which deals with motor vehicle driving and outside helpers[‡]) and HO 12 (which deals with power-driven paper products machines). Legislation has also been introduced to permit minors aged 16 and 17 to spend as much as 49% of each workday driving. Since the child labor provisions place absolutely no limits on the number of hours these minors may work, the amount of time spent behind the wheel could be substantial. Legislation has been introduced to permit minors aged 16 and 17 to load but not operate or unload paper balers and compactors that meet safety and engineering standards issued by the American National Standards Institute.

State Child Labor Laws

Almost all States have child labor laws, mandatory school attendance laws, and requirements for issuance of work permits or age certificates. State laws often mimic the Federal provisions, but many differences exist. The effectiveness of State laws often depends on the numbers and kinds of exemptions permitted and the commitment made to enforcement. When both the Federal and State child labor provisions apply, the employer is held to the stricter standard.

State Workers' Compensation Laws

State workers' compensation laws also affect child labor. Reporting requirements can provide valuable injury data for industries and other workplace settings where minors are injured.

‡An outside helper is any person other than a driver whose work includes riding on a motor vehicle outside the cab for the purpose of assisting in transporting or delivering goods.

Some State compensation laws may also provide for increased rates or fines when youths under age 18 are injured in violation of Federal

or State child labor laws. However, many State laws also limit the legal remedies for the occupational injury or death of youths under age 18.

4 NATIONAL OBJECTIVES FOR THE OCCUPATIONAL SAFETY AND HEALTH OF YOUTHS

BOTH the Federal Government and the private sector have numerous national objectives that intersect with the mission of the Child Labor Working Team to reduce injuries and illnesses in young workers and to prepare them for encountering workplace hazards. These objectives are summarized below and outlined in more detail in Appendix D.

Federal Objectives

The Federal Government has identified national objectives for the occupational safety and health of youths at the departmental level (U.S. Department of Health and Human Services [DHHS]) and within the Centers for Disease Control and Prevention (CDC) and NIOSH. Congress has established similar objectives in recent legislation.

The U.S. Secretary of Health and Human Services and the Russian Minister of Health and Medical Industry signed a joint policy statement on health education for children in January 1996 [Shalala and Tsaregorodtsev 1996]. This statement affirms the importance of giving children fundamental knowledge about how to live healthy lives. The statement also calls on citizens and education and health professionals to support and provide quality health education that uses families, communities, and educational and health institutions to transmit essential information about health risks.

Healthy People 2000 [DHHS 1994] is a national strategy for significantly improving the

health of the Nation during 1990–2000. This document calls for a reduction in adolescent work injury rates and an increase in school health education (including instruction in injury prevention and control and community-based approaches to meet *Healthy People 2000* objectives) [DHHS 1994].

Youths are the newest priority area for CDC [CDC 1996a]. One of the 21 research priority areas identified in the NIOSH *National Occupational Research Agenda* is *special populations at risk*, which includes children and adolescents [NIOSH 1996b].

The School-to-Work Opportunities Act (Public Law 103–329), the Goals 2000—Educate America Act (Public Law 103–227), and the Carl D. Perkins Vocational and Applied Technology Education Act (Public Law 101–392) all seek to produce students who are prepared for the world of work. The School-to-Work Opportunities Act and the Carl D. Perkins Vocational and Applied Technology Education Act specifically require instruction in “all aspects of the industry,” a term that explicitly includes occupational safety and health.

Private Sector Objectives

Public health and child advocacy groups in the private sector have called for research and prevention efforts focused on the occupational safety and health of youths. The National Committee for Childhood Agricultural Injury Prevention has published a report with 13 recommendations for reducing the toll of

agriculture on children [National Committee for Childhood Agricultural Injury Prevention 1996]. All but one of these recommendations fall within the purview of NIOSH (including surveillance, etiologic and intervention research, and educating the public and specific stakeholders about agricultural risks to children). The National Safety Council has released a policy statement encouraging research to reduce the risks posed to children by tractors—a machine that accounts for substantial numbers of childhood agricultural deaths each year [National Safety Council 1996]. The American Public Health Association

(APHA) recommends conducting research into the safety and health of working children, incorporating occupational safety and health training into school curricula, educating stakeholders about the occupational risks of youths, and coordinating the efforts of the DHHS and the DOL in controlling and preventing occupational injuries in youths [APHA 1995]. The Child Labor Coalition of the National Consumers League has called for research and a comprehensive multiagency response to occupational safety and health concerns about young workers [Child Labor Coalition 1993].

5 NIOSH PROJECTS FOCUSED ON CHILDREN AND ADOLESCENTS

MOST NIOSH research and activities have implications for children and adolescents. For example, the FACE Program investigates certain types of deaths and injuries of children and adolescents, and the Dirty Dozen Project (which conducts hazard surveys in selected workplaces) has investigated health hazards in vocational education programs. Programs supported by the Agricultural Safety Promotion System affect children as well as adults in agricultural communities. Workplace designs that deter robbery and robbery-related homicide affect youths as well as older workers. And control technologies that minimize or reduce exposures to hazardous substances benefit all potentially exposed workers, regardless of age.

The NIOSH projects described in this section were in progress as of July 1, 1996. These projects have a particular focus on children and adolescents and take into account the unique characteristics and needs of this worker population as well as unique opportunities for prevention. The impacts of these projects will not be restricted to working children and adolescents. Control measures that reduce hazardous exposures to children will also protect older workers with similar exposures. Evaluation of community-based educational efforts can guide similar efforts for other worker groups. Also, providing children and adolescents with occupational safety and health knowledge and skills may reduce injury and illness rates in our future workforce.

Occupational Injuries in Children and Adolescents

A number of existing injury databases have unfulfilled potential for closing information gaps

about occupational injuries in adolescents and children. Databases with the potential to advance our knowledge about this problem include the SOII, the National Hospital Ambulatory Medical Care Survey, hospital discharge databases, CFOI, NTOF, and NEISS. These and other databases will be evaluated to determine their potential to (1) supplement knowledge about the size of the problem, (2) provide detailed information about circumstances or risks that could promote prevention efforts and research, (3) provide information about the impact of the injuries on young lives and futures, and (4) evaluate changes in the patterns or incidence of injuries over time.

Promising analyses are pursued and findings are disseminated through the Child Labor Working Team, presentations at meetings, and publication in peer-reviewed journals and health education documents. The Child Labor Working Team has successfully encouraged the use of available data in intervention and research activities—both by NIOSH and other stakeholders such as the Wage and Hour Division of the DOL and the School-to-Work Program.

Hazard Surveillance and Injury Investigation of Paper Baling Machinery

Recent congressional activities may result in the relaxation of restrictions on the current child labor regulation that prohibits the use of paper balers by children under age 18. NIOSH and others are concerned that this shift in policy may result in substantial numbers of disabling injuries and deaths among working adolescents. This project has initiated active

surveillance to identify injuries that occur in adolescents and to collect information about the circumstances of baler-related injuries. The case surveillance involves (1) review of data as they come into NIOSH from the NEISS and FACE projects, (2) notification by DOL investigators (Wage and Hour Division) of injuries to minors, (3) notification by the NIOSH-supported Sentinel Event Notification System for Occupational Risks (SENSOR) Program of serious work injuries to minors, (4) notification by the SENSOR Program of amputations, (5) notification by the Maryland FACE program of cases identified through review of workers' compensation data, (6) notification by a network of medical examiners and coroners of the deaths of minors, and (7) notification by a newspaper clipping service of deaths and injuries of minors. Investigations based on the FACE model will be conducted for fatal and nonfatal injuries.

Hazard Control Evaluation of the Safety Device Technology for Cardboard Paper Balers

Evidence indicates a need to improve the maintenance technology for hydraulic interlock safeguarding in paper baling equipment. The need has been suggested in a NIOSH report to the DOL Wage and Hour Division with regard to their standards for protecting workers aged 16 and 17. The project objective is to provide a hazard control assistance report to users of cardboard baling equipment. The report will (1) describe the range of hydraulic interlock (gate-type) safeguard technology being used on cardboard balers in the United States, (2) provide the results of a safety analysis of types that have not been previously reviewed by NIOSH, and (3) recommend gate-type, hydraulic interlock safeguards whose effectiveness should be tested in the laboratory.

The project team is composed of NIOSH and external personnel with appropriate control technology skills. Project methods involve site visits to evaluate the safeguarding of paper baling equipment, laboratory reviews of safeguarding methods, and task team development of a comprehensive equipment survey report and recommendations. During the current project year, the team identified areas that need to be reviewed to assure safer hydraulic equipment such as balers. These areas include the actual and required structural strength of safeguard components (such as support structures, fasteners, and barrier material areas), development of interlocking for gate-type safeguards that responds to structural indications of jammed equipment, and laboratory evaluation of machine components for safely starting and stopping machine motion. The Team plans a workshop to examine the review area and recommend priorities for effective research on preventing machine-related injuries.

Hazards of Youth Work

This project was funded by NIOSH as a research grant to the North Carolina Injury Prevention Research Center through the National Center for Injury Prevention and Control. The following description of the project is based on a draft progress report [Runyan 1996]. The study is one of the first in the Nation to seek information about exposures of adolescents to workplace hazards. The goal of this interdisciplinary project is to describe the following: hazards to which adolescents are exposed in the workplace, protective practices used by adolescents in specific jobs, adolescent perceptions and reactions to workplace hazards, and knowledge of adolescent workers about hazards, protective strategies, and child labor restrictions. This study includes a telephone survey of a Statewide sample of 572 working youths aged 14 to 17 and a survey of a Statewide purposive sample of 323 youths aged

14 to 17 involved in a 4-H program via self-administered questionnaire. The project includes a followup survey of youths interviewed in 1995 and focus groups of selected youths working in targeted industries (food service, grocery stores, and other retail trades). This project lays the foundation for a national study of exposures to work-related hazards among youths.

Massachusetts SENSOR—Serious Occupational Injuries to Youths

In a cooperative agreement with NIOSH, the Massachusetts Department of Public Health is working to develop and evaluate a Statewide, case-based surveillance and intervention system for occupational injuries to youths under age 18. At the core of this system are departmental regulations requiring physicians and hospitals to report work-related injuries of youths under age 18 to the Department. The Department is conducting active outreach to hospital emergency departments to solicit reports and to explore the use of computerized emergency department or billing data to generate reports. Workers' compensation claims for minors, hospital discharge data, Massachusetts Burn Registry data, and CFOI data are also used to determine cases. Interviews are conducted with youths having serious injuries and with those having less serious injuries in selected occupations. Memoranda of understanding have been signed with the DOL Region I Wage and Hour Division and OSHA to facilitate referrals. The Massachusetts Department of Public Health is working with other agencies on a variety of educational interventions.

A new component was added to this project in FY96 to begin filling information gaps about work-related health hazards that may cause short- or long-term health effects. The project industrial hygienist arranges workplace visits,

makes observations, and interviews employers, supervisors, and working youths. The industrial hygienist observes work tasks performed by youths and identifies hazardous exposures or conditions. Protective measures are noted, including ventilation, personal protective equipment, training, and supervision. A special focus in the upcoming year will be hazards in vocational schools. A summary report will include recommendations for future health hazard research.

Missouri Agricultural Safety Promotion System

The Agricultural Safety Promotion System is designed to stimulate the development and implementation of agricultural safety and health intervention programs to reduce agricultural injuries and exposures to safety hazards. The primary emphasis is to assess the effectiveness of proposed intervention programs. The program is intended to (1) reduce the incidence of agricultural injuries and fatalities by implementing intervention projects immediately, and (2) provide practitioners with useful information about the effectiveness of the intervention programs. The Missouri Agricultural Safety Promotion System aims at preventing youth injuries through peer education. The University of Missouri at Columbia is therefore developing a peer approach to educating youths about agricultural safety. A multidisciplinary team of adult leaders is being trained to develop youth safety programs for FFA members. These members are instructed to teach agricultural safety (safety hazards, prevention measures, and concepts) to younger children. The premise is that children learn more readily from other children. One curriculum has been developed for use by FFA members, and another is being developed for classroom use by FFA instructors. This approach requires adequately trained adults to support the instructors. The primary target audience is FFA members, and the secondary target audience is

rural elementary students. The program effectiveness will be evaluated by assessing the behavioral intentions of the target populations. Pre- and post-testing will provide data to evaluate whether behavioral intentions were measurably improved in both FFA instructors and students. College courses in agricultural safety will also be developed.

Promoting Safety and Health in Vocational, Technical, and Industrial Programs: Guidelines and Curricula

The immediate goal of this project is to increase the safety awareness and education of the Nation's vocational school teachers and administrators so that they can pass this information to students before they enter the work environment. The ultimate goal is to produce students (future American workers) knowledgeable in occupational safety and health. Industries will thus be provided with employees informed about occupational safety and health issues. Toward these goals, this project will develop training materials to help students recognize safety and health hazards in vocational shops, employ safe work practices, and eliminate hazards. The 1981 edition of *Safety & Health for Industrial/Vocational Education* will be revised and updated. The training materials in the manual will be evaluated through a pilot test and revised before a mass printing of the manual. Training materials could be developed in a CD-ROM or CD-interactive format and displayed on the NIOSH Home Page on the Internet. NIOSH will collaborate with the American Vocational Association, the Vocational Industrial Clubs of America, State vocational directors, and the U.S. Department of Education to develop or disseminate recommended curricula and policy for occupational safety and health in all vocational schools. A

secondary objective is to expand the program to colleges that graduate teachers for vocational schools.

Enhancing Young Workers' Safety and Health Through Community Education Efforts

In FY96, the NIOSH Education and Information Division embarked on three 2-year community health education projects to enhance young workers' occupational safety and health. The partners in this effort are (1) the Massachusetts Department of Health (and the Brockton Public Schools, Brockton, Massachusetts), (2) the University of California at Berkeley (and the Oakland Unified School District, Oakland, California), and (3) the University of California at Los Angeles (and the Los Angeles Unified School District). These projects attempt to arouse a community response to young workers' safety and health issues and thereby stimulate a variety of education and awareness efforts by community members. A project advisory group has been established in each community. This group broadly represents community interests such as labor, education, business, government, public health, parents, young workers, etc.

The early months of the projects have been spent collecting formative data about (1) employment patterns of young workers, (2) knowledge and attitudes about young worker safety and health issues, and (3) health education and peer counseling services that now exist for youths within the communities. A survey of knowledge and attitudes was administered to a convenient sample of students in each community and to a sample of students in North Carolina (administered by the University of North Carolina, Injury Prevention and

Research Center). These data can be used to compare baseline knowledge and attitudes across communities.

Health educators on the staffs of the three partner public health organizations are working with community members to devise materials for use in awareness sessions in community groups and school classrooms. The early phases of the projects emphasize creating an awareness of the issues. The second year emphasizes establishing an ongoing effort to educate students and other community members. These health educators have already developed innovative approaches such as risk analysis games, risk-mapping exercises, and photo novella vignettes, which they are testing in the communities.

Two types of evaluation data are being collected: process and outcome. Process evaluation data allow analysis of the community intervention effort at the community level. The life of each community project (its successes and failures, the timing of events, participation, etc.) will be assessed to provide administrative guidance for future efforts in other communities. Outcomes will be evaluated primarily using individuals as units of analysis. Knowledge and behavior changes will be assessed to identify the education strategies that worked best. From these data, a community education handbook (precise medium to be determined) will be developed for other communities to undertake similar efforts.

Adverse Neurobehavioral Effects in Children of Farm Workers

The University of California Center for Agricultural Research, Education, and Disease and Injury Prevention (one of eight such centers funded by NIOSH) is conducting a study to determine the risk of adverse neurobehavioral effects in the children of farm workers. Researchers at this Center are evaluating children's exposure to organophosphate pesticides, which may occur through their parents' agricultural field work. Exposed children may be more likely to show adverse neurobehavioral effects than children whose parents do not work in agriculture. This study focuses on the prevalence of organophosphate pesticide exposures in infants and preschoolers, the prevalence of neurobehavioral problems that might result from such exposures, and parental occupation as a potential source of the children's exposure.

Support of Farm Safety 4 Just Kids

The eight NIOSH-supported Centers for Agricultural Research, Education, and Disease and Injury Prevention support chapters of the national organization Farm Safety 4 Just Kids. Established by a farm mother as a result of her 12-year-old son's death, this organization alerts parents and children to the hazards of farm work. The network of chapters in the United States is growing—partly as a result of their collaboration with the staff at the NIOSH-funded Centers, who share health education materials and tools for increasing participation among farm children.

6 RESEARCH NEEDS

WHEN identifying occupational safety and health research needs for children and adolescents, the Child Labor Working Team considered existing knowledge, current research efforts, and needs expressed by stakeholders. These research needs are outlined in the following subsections.

Improved Surveillance for Work-Related Injuries and Illnesses of Children and Adolescents

Substantial gaps exist in the coverage provided by occupational injury surveillance systems, and concerns exist about their underestimation of injuries in children and adolescents. Problems are greatest in the agricultural sector, but they occur across all industries. The occupational safety and health community needs to standardize nomenclature and establish a minimum data set to be collected on occupational injuries in children and adolescents. We need better understanding of the types of work children and adolescents do, the hazards they are exposed to, and the distribution of risk factors. The health outcomes of childhood work exposures have been hypothesized but not quantified. Information is needed to define the severity of disease and injury and the economic and social consequences. Consequently, we do not know the true impact of injuries and illnesses among children and adolescents. We need detailed information about the circumstances and contributing factors to inform intervention and research efforts. Surveillance at the State or local level can be an effective

means for determining the focus for local intervention efforts.

Research to Identify Risk Factors for Work Injuries and Illnesses of Children and Adolescents

Children and adolescents appear to have a relatively high rate of occupational injury compared with adults. Numerous factors unique to children and adolescents may increase their risk for injury and illness. These factors include minimal work experience, lack of training in hazard recognition and safe work practices, and risk factors associated with physical and psychosocial development. To direct intervention efforts, we need to assess and quantify risk factors for injury and illness among working children and adolescents.

Research to Assess the Age-Appropriateness of Work Tasks

At least two groups with substantial expertise in agricultural work injuries and illnesses have called for research to assess age-appropriate or developmentally appropriate work tasks: the National Committee for Childhood Agricultural Injury Prevention [1996] and the Agricultural Division of the National Safety Council [1996]. Guidelines for age-appropriate tasks are needed for the nonagricultural sector as well. Ultimately, child labor regulations serve as lists of age-appropriate and -inappropriate work tasks. Decisions about appropriate work tasks for children and adolescents need to be

guided by scientific data, theory, and principles in both regulatory and nonregulatory environments.

Intervention Research

A broad range of intervention research is needed to address the engineering, administrative, and behavioral aspects of child labor hazards. These aspects must be addressed both separately (with targeted interventions that have narrowly defined outcome measures) and collectively (with interventions that have multiple outcome measures) [Goldenhar and Schulte 1994, 1996]. A solid research base is needed to focus interventions effectively. Implementation barriers and aides must be identified. Numerous interventions have been made to prevent work injuries to children and adolescents. Their effectiveness must be rigorously evaluated to identify the most efficient strategies and to assure that interventions do not have adverse consequences such as increased injury or illness rates from increased exposures.

Cost/Benefit Analyses of Models for the Healthful Employment of Children and Adolescents

Occupational safety and health professionals associate investments in injury and illness prevention with reduced costs as well as saved lives and limbs. However, data have not always been collected to document this association. Employers may be reluctant to invest in efforts with intangible benefits, especially if they perceive a low risk for injury and illness among their workers. A useful tool for safety and health programs would be model programs or best practices for healthful employment of working children and adolescents, with documented impacts on costs and productivity.

Research to Promote Occupational Safety and Health Education for Adolescents in School-Based or -Facilitated Work Experience Programs

Recent Federal initiatives such as *School-to-Work* heighten awareness about the occupational risks facing adolescents, and they provide opportunities for youths to be trained in occupational safety and health during their formative years. Recent NIOSH initiatives have assessed hazards and training needs in the vocational education environment. NIOSH hazard assessments in 11 vocational schools indicate the need for further evaluation. Not all of the schools were aware of the safety and health concerns associated with the industrial trades. The NIOSH assessments noted a lack of respirator programs and minimal hearing conservation programs. Many of the students were learning disabled. Hazard identification and intervention programs are needed to ensure safe educational environments for children and to provide critical knowledge about occupational safety and health.

Refinement and Expansion of Community-Level Interventions to Promote Safe and Healthful Work Experiences for Children and Adolescents

Every community sees the protection of its youth as a high priority. Children and adolescents, parents and other family members, school teachers and counselors, employers and community groups all have a stake in safe and healthful work experiences for children and adolescents. Targeted approaches to prevention hold tremendous potential for success and institutionalization of efforts. NIOSH demonstration projects will need to be tested in other communities to broaden our understanding and build on this knowledge.

7 RECOMMENDATIONS FOR COORDINATION, COLLABORATION, AND PARTNERSHIPS

PROTECTING young workers in the Nation's labor force requires the efficient efforts of multiple stakeholders. Several Federal agencies have active programs, and the need exists for routine communication, collaboration, and coordination of these programs. A number of State programs exist to protect young workers, and Federal agencies may cooperate in these efforts. Finally, the public sector should be an active partner in protecting working children and adolescents and preparing them for the world of work.

Interagency Coordination and Collaboration

The DOL has a number of agencies active in areas that affect young workers. The Wage and Hour Division of the Employment Standards Administration establishes Federal child labor standards, including standards for employing workers and standards listing certain types of work as too dangerous for children. NIOSH and the Wage and Hour Division have worked closely on several of these issues. NIOSH should continue to provide technical expertise to the Wage and Hour Division and to encourage the DOL to review and update child labor standards routinely as new data accumulate.

OSHA has jurisdiction over safety and health in the workplace, including certain workplaces employing a high percentage of young workers. Some of these workplaces (such as eating and drinking establishments) have high rates of injury. NIOSH needs to coordinate efforts with OSHA in studying injuries and illnesses among young workers in these industrial

sectors. NIOSH should encourage OSHA to consider youths when setting standards and targeting interventions. OSHA should also be encouraged to continue the cross-training of OSHA inspectors on child labor issues.

NIOSH should encourage BLS to conduct surveys and report data in a form that provides information about young workers. Surveys should include information about workers under age 15, and data should be published in age groupings that facilitate interpretations of child labor issues. BLS should be encouraged to address survey design issues such as the use of proxies, which may contribute to inaccurate estimates of youth employment. Finally, BLS should be encouraged to conduct periodic supplements to the CPS to generate stable, State-specific estimates of youth employment.

NIOSH should also work with the School-to-Work Office (which is jointly administered by the Departments of Labor and Education) and the Office of Vocational and Adult Education within the Department of Education to ensure that youths in these programs work in safe and healthful work environments and receive knowledge and skills in occupational safety and health. NIOSH should also encourage these agencies to institutionalize the reporting of injuries and illnesses associated with school-based or -facilitated work experience programs (as British Columbia does [Province of British Columbia Ministry of Education 1995]). NIOSH should work with the Division of Adolescent and School Health of the National Center for Chronic Disease Prevention

and Health Promotion (CDC, DHHS) to include basic occupational safety and health in school health efforts.

NIOSH should encourage other agencies that conduct surveys of youths or families to incorporate questions that fill data gaps about outcomes of youth employment. Examples of such surveys are the Health Interview Survey conducted by the National Center for Health Statistics (CDC, DHHS), the Survey of Income and Program Participation conducted by the Bureau of the Census, and the Youth Risk Behavioral Surveillance System conducted by the Division of Adolescent and School Health of the National Center for Chronic Disease Prevention and Health Promotion (CDC, DHHS).

NIOSH should communicate regularly with the National Center for Injury Prevention and Control (CDC, DHHS) about issues surrounding youths. Such communication would identify potential collaborations and foster the exchange of information about risk factors for adolescent injury. The Office of Rural Health Policy of the Health Resources and Services Administration (DHHS) has programs directed at young workers on farms, as does the U.S. Department of Agriculture. The Child Labor Working Team has representatives from both groups.

NIOSH and other Federal agencies should coordinate research and intervention efforts when young workers are exposed to toxic substances with chronic effects—especially

carcinogens and neurotoxics. The U.S. Environmental Protection Agency (EPA) has made children's health a priority and is developing risk assessment models for children and infants [APHA 1996]. The Agency for Toxic Substances and Disease Registry has a new children's health initiative that emphasizes child health in all of the Agency's programs and activities.

NIOSH should communicate with the Maternal and Child Health Bureau of the Health Resources and Services Administration (DHHS) to determine its possible role in their program entitled *Preparing for Adolescent Transitions: Healthy and Ready for Work*.

State Partnerships

States often serve as the jurisdictional unit for intervention and data collection efforts. NIOSH should recognize State roles in research and prevention and use the expertise they can provide. NIOSH should also promote its ability to provide technical expertise to States.

Private Organization Partnerships

NIOSH should continue to encourage relationships with labor and trade organizations, child health advocates, and research and public health groups to promote safe and healthy workplaces for youths. NIOSH needs to be responsive to the information needs of these groups and to use them to disseminate critical information about occupational safety and health for youths.

REFERENCES

- Aherin RA, Todd CM [1989]. Developmental stages of children and accident risk potential. Presented at the International Winter Meeting of the American Society of Agricultural Engineers. Text available on URL: <http://www.ag.uiuc.edu/agsafety/devstage.html>
- Allensworth DD, Kolbe LJ [1987]. The comprehensive school health program: exploring an expanded concept. *J Sch Health* 57(10): 409–412.
- APHA (American Public Health Association) [1995]. 9405: Protection of child and adolescent workers. *Am J Public Health* 85(3):440–442.
- APHA (American Public Health Association) [1996]. Environmental Protection Agency appropriations fact sheet. Washington, DC: American Public Health Association.
- Banco L, Lapidus G, Braddock M [1992]. Work-related injury among Connecticut minors. *Pediatrics* 89(5):957–960.
- Belville R, Pollack SH, Godbold JH, Landrigan PJ [1993]. Occupational injuries among working adolescents in New York State. *JAMA* 269(21):2754–2759.
- Blackorby J [1993]. Participation in vocational education by students with disabilities. In: Wagner M, ed. *The secondary school programs of students with disabilities: a report from the National Longitudinal Transition Study of Special Education Students*. Menlo Park, CA: SRI International, pp. 5-1 to 5-48.
- BLS [1992]. *Work and family: jobs held and weeks worked by young adults*. Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics, Report 827.
- BLS [1995a]. *Geographic profile of employment and unemployment, 1994*. Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics, Bulletin 2469.
- BLS [1995b]. *Occupational injuries and illnesses: counts, rates, and characteristics, 1992*. Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics, Bulletin 2455.
- BLS [1996]. *Employment and earnings*. Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics.
- Brooks DR, Davis LK [1996]. Work-related injuries to Massachusetts teens, 1987–1990. *Am J Ind Med* 29:153–160.
- Brooks DR, Davis LK, Gallagher SS [1993]. Work-related injuries among Massachusetts children: a study based on emergency department data. *Am J Ind Med* 24:313–324.
- Broste SK, Hansen DA, Strand RL, Stueland DT [1989]. Hearing loss among high school farm students. *Am J Public Health* 79(5): 619–622.
- Bush D, Baker R [1994]. *Young workers at risk: health and safety education and the schools*. Berkeley, CA: University of California at Berkeley, Center for Occupational and Environmental Health, Labor Occupational Health Program.
- Carskadon MA [1989]. Adolescent sleepiness: increased risk in a high-risk population. *Alcohol, Drugs and Driving* 5(4)/6(1):1–12.

- Carskadon MA [1990]. Patterns of sleep and sleepiness in adolescents. *Pediatrician* 17: 5-12.
- Carskadon MA, Harvey K, Duke P, Anders TF, Litt IF, Dement WC [1980]. Pubertal changes in daytime sleepiness. *Sleep* 2(4): 453-460.
- Castillo DN, Landen DD, Layne LA [1994]. Occupational injury deaths of 16- and 17-year-olds in the United States. *Am J Public Health* 84(4):646-649.
- CDC [1996a]. Vision: healthy people in a healthy world through prevention. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention.
- CDC [1996b]. Work-related injuries and illnesses associated with child labor—United States, 1993. *MMWR* 45(22):464-468.
- CFR. Code of Federal regulations. Washington, DC: U.S. Government Printing Office, Office of the Federal Register.
- Child Labor Coalition [1993]. A Capitol Hill briefing: children who work—challenges for the 21st century. Washington, DC: National Consumers League.
- Child Labor Coalition [1995]. NIOSH funds community-based programs. Washington, DC: National Consumers League, *Child Labor Monitor* V(111).
- Children's Safety Network at Education Development Center, Inc., and Massachusetts Occupational Health Surveillance Program [1995]. Protecting working teens: a public health resource guide. Newton, MA: Education Development Center, Inc.
- Coleman PJ, Sanderson LM [1983]. Surveillance of occupational injuries treated in hospital emergency rooms—United States, 1982. *MMWR* 32(2SS):31SS-37SS.
- COMMIT Research Group [1995]. Community intervention trial for smoking cessation (COMMIT): I. Cohort results from a four-year community intervention. *Am J Public Health* 85(2):183-192.
- Committee on Environmental Health [1995]. The hazards of child labor. *Pediatrics* 95(2): 311-313.
- Cooper SP, Rothstein MA [1995]. Health hazards among working children in Texas. *South Med J* 88(5):550-554.
- CPSC [1993]. Ride-on mower hazard analysis (1987-1990). Washington, DC: U.S. Consumer Product Safety Commission, Division of Hazard Analysis, Directorate for Epidemiology, National Injury Information Clearinghouse. Unpublished data.
- Dacquel LT, Dahmann DC [1993]. Residents of farms and rural areas: 1991. Washington, DC: U.S. Department of Agriculture, U.S. Department of Commerce, U.S. Government Printing Office, Current Population Report No. P20-472.
- Derstine B [1994]. Young workers at risk of fatal injuries. Paper presented at the 122nd Annual Meeting and Exhibition of the American Public Health Association, Washington, DC, October 30, 1994.
- DHHS [1994]. Healthy people 2000: national health promotion and disease prevention objectives. Washington, DC: U.S. Department of Health and Human Services, U.S. Government Printing Office, DHHS Publication No. (PHS) 94-1232-1.

- Dunn KA, Runyan CW [1993]. Deaths at work among children and adolescents. *Am J Dis Child* 147:1044–1047.
- Duran R, Miara C [1995]. Enhancing young worker health and safety: student focus groups: preliminary report. Newton, MA: Education Development Center.
- Ehlers JK [1992]. Occupational health and safety education in high school agricultural education [Thesis]. Cincinnati, OH: University of Cincinnati.
- Fajen J, Wallace M, Lentz TJ, Baver R [1996]. Report on preliminary industrial hygiene survey and health hazards investigation conducted at Southeastern Career Center, Versailles, Indiana, January 24, 1996. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health; and University of Cincinnati, Department of Environmental Health.
- 59 Fed. Reg. 25164 [1994]. Department of Labor: child labor regulations, orders and statements of interpretation; proposed rules.
- Finch MD, Mortimer JT, Ryu S [1997]. Transition into part-time work: health risks and opportunities. In: Schulenberg J, Maggs J, Hurrelmann K, eds. Health risks and developmental transitions during adolescence. Cambridge, UK: Cambridge University Press.
- Fortmann SP, Taylor CB, Flora JA, Jatulis DE [1993]. Changes in adult cigarette smoking prevalence after 5 years of community health education: the Stanford Five-City Project. *Am J Epidemiol* 137(1):82–96.
- GAO [1990]. Child labor: increases in detected child labor violations throughout the United States. Washington, DC: U.S. General Accounting Office, GAO/HRD–90–116.
- GAO [1991]. Child labor: characteristics of working children. Washington, DC: U.S. General Accounting Office, GAO/HRD–91–83BR.
- Goldenhar LM, Schulte PA [1994]. Intervention research in occupational health and safety. *J Occup Med* 36(7):763–775.
- Goldenhar LM, Schulte PA [1996]. Methodological issues for intervention research in occupational health and safety. *Am J Ind Med* 29(4):289–294.
- Heinzman M, Thoreson S, McKenzie L, Cook M, Hoffman RE, Parker D, et al. [1993]. Occupational burns among restaurant workers—Colorado and Minnesota. *MMWR* 42(37):713–716.
- Heyer NJ, Franklin G, Rivara FP, Parker P, Haug JA [1992]. Occupational injuries among minors doing farm work in Washington State: 1986 to 1989. *Am J Public Health* 82(4):557–560.
- Iowa FACE Program [1995]. Farmer killed from tractor rollover while loading hay on hillside—Iowa. Iowa City, IA: The University of Iowa, Iowa FACE Program.
- Kelsey JL, Golden AL [1987]. Occupational and workplace factors associated with low back pain. *Spine: State of the Art Rev* 2(1):7–16.
- Kelsey TW [1994]. The agrarian myth and policy responses to farm safety. *Am J Public Health* 84(7):1171–1177.
- Kidd PS, Holton C [1993]. Driving practices, risk-taking motivations, and alcohol use

- among adolescent drivers: a pilot study. *J Emerg Nurs* 19(4):292–296.
- Knight EB, Castillo DN, Layne LA [1995]. A detailed analysis of work-related injury among youth treated in emergency departments. *Am J Ind Med* 27:793–805.
- Layne LA, Castillo DN, Stout N, Cutlip P [1994]. Adolescent occupational injuries requiring hospital emergency department treatment: a nationally representative sample. *Am J Public Health* 84(4):657–660.
- Luepker RV, Murray DM, Jacobs DR et al. [1994]. Community education for cardiovascular disease prevention: risk factor changes in the Minnesota Heart Health Program. *Am J Public Health* 84:1383–1393.
- Massachusetts SENSOR Program [1993]. Massachusetts SENSOR quarterly progress report: April 1, 1993–June 30, 1993. Boston, MA: The Commonwealth of Massachusetts, Executive Office of Health and Human Services, Department of Public Health, Bureau of Health Statistics, Research and Evaluation.
- Massachusetts SENSOR Program [1995]. Massachusetts SENSOR Program quarterly progress report: October 1, 1994–December 31, 1994. Boston, MA: The Commonwealth of Massachusetts, Executive Office of Health and Human Services, Department of Public Health.
- Merke DP, Miller RW [1992]. Age differences in the effects of ionizing radiation. In: Guzejian PS, Henry CJ, Olin SS, eds. *Similarities and differences between children and adults*. Washington, DC: ILSI Press, pp. 139–149.
- Milgrom C, Finestone A, Shlamkovitch N, Rand N, Lev B, Simkin A, et al. [1994]. Youth is a risk factor for stress fracture. *J Bone Joint Surg Br* 76-B(1):20–22.
- Miller M [1995]. *Occupational injuries among adolescents in Washington State, 1988–1991: A review of workers' compensation data*. Olympia, WA: Safety and Health Assessment and Research for Prevention, Washington State Department of Labor and Industries, Technical Report No. 35–1–1995.
- Mitchell LV, Lawler FH, Bowen D, Mote W, Asundi P, Purswell J [1994]. Effectiveness and cost-effectiveness of employer-issued back belts in areas of high risk for back injury. *J Occup Med* 36(1):90–94.
- National Committee for Childhood Agricultural Injury Prevention [1996]. *Children and agriculture: opportunities for safety and health*. Marshfield, WI: Marshfield Clinic.
- National Research Council [1993]. *Pesticides in the diets of infants and children*. Washington, DC: National Academy Press.
- National Safety Council [1996]. *Council approves policy on childhood risks*. Itasca, IL: National Safety Council, Agricultural Division, Newsletter, March/April, 1996.
- NCHS [1976]. *NCHS growth charts, 1976*. Rockville, MD: National Center for Health Statistics, Health Resources Administration, Monthly Vital Statistics Report 25(3)(Suppl. HRA):76–11s20.
- NIOSH [1986a]. *General laborer electrocuted in North Carolina*. Morgantown, WV: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, Fatality Assessment and Control Evaluation (FACE) Report No. 8632II.
- NIOSH [1986b]. *Part-time laborer electrocuted in Ohio*. Morgantown, WV: U.S. Department of Health and Human Services, Public

Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, Fatality Assessment and Control Evaluation (FACE) Report No. 8627II.

NIOSH [1988]. Assistant pool manager electrocuted. Morgantown, WV: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, Fatality Assessment and Control Evaluation (FACE) Report No. 8835.

NIOSH [1993]. Fatal injuries to workers in the United States, 1980–1989: a decade of surveillance: national profile. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 93–108.

NIOSH [1994]. Comments of the National Institute for Occupational Safety and Health on the Department of Labor/Wage and Hour Division advance notice of proposed rulemaking on child labor regulations, orders and statements of interpretation, October 25, 1994. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health.

NIOSH [1995]. NIOSH Alert: request for assistance in preventing deaths and injuries of adolescent workers. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 95–125.

NIOSH [1996a]. Fatality Assessment and Control Evaluation (FACE) Program. Morgantown, WV: U.S. Department of Health and

Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. Unpublished database.

NIOSH [1996b]. National occupational research agenda. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 96–115.

NIOSH [1997]. National Traumatic Occupational Fatalities (NTOF) Surveillance System. Morgantown, WV: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. Unpublished database.

Parker DL, Carl WR, French LR, Martin FB [1994a]. Characteristics of adolescent work injuries reported to the Minnesota Department of Labor and Industry. *Am J Public Health* 84(4): 606–611.

Parker DL, Carl WR, French LR, Martin FB [1994b]. Nature and incidence of self-reported adolescent work injury in Minnesota. *Am J Ind Med* 26:529–541.

Pollack SH, Landrigan PJ, Mallino DL [1990]. Child labor in 1990: prevalence and health hazards. *Ann Rev Public Health* 11:359–375.

Province of British Columbia Ministry of Education [1995]. Work experience handbook: policy, guidelines and best practices. British Columbia: Ministry of Education, Skills Branch.

Richter ED, Jacobs J [1991]. Work injuries and exposures in children and young adults: review and recommendations for action. *Am J Ind Med* 19:747–769.

- Ries PW [1978]. Episodes of persons injured: United States, 1975. *Adv Data* 18:1–12.
- Runyan C [1996]. Draft progress report: hazards of youth work (May 1996). Chapel Hill, NC: University of North Carolina Injury Prevention Research Center.
- Schober SE, Handke JL, Halperin WE, Moll MB, Thun MJ [1988]. Work-related injuries to minors. *Am J Ind Med* 14:585–595.
- Shalala DE, Tsaregorodtsev AD [1996]. Joint declaration on health education for children. *J School Health* 66(4):123.
- Silvestri GT [1994]. Occupational employment: wide variations in growth. In: *The American work force: 1992–2005*. Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics, Bulletin 2452, pp. 56–84.
- Smith RE, Ptacek JT, Smoll FL [1992]. Sensation seeking, stress, and adolescent injuries: a test of stress-buffering, risk-taking, and coping skills hypotheses. *J Pers Soc Psychol* 62(6):1016–1024.
- Stallones L, Gunderson P [1994]. Epidemiologic perspectives on childhood agricultural injuries within the United States. *J Agromedicine* 1(4):3–18.
- State of Wyoming [1984]. Characteristics of youth occupational injuries and illnesses 1979–1983. Cheyenne, WY: Wyoming Department of Labor and Statistics.
- Steinberg L, Cauffman E [1995]. The impact of employment on adolescent development. *Ann Child Dev* 11:131–166.
- Suruda A, Halperin W [1991]. Work-related deaths in children. *Am J Ind Med* 19:739–745.
- Susser M [1995]. Editorial: The tribulations of trials—interventions in communities. *Am J Public Health* 85:156–158.
- Terman DL, Larner MB, Stevenson CS, Behrman RE [1996]. Special education for students with disabilities: analysis and recommendations. *The Future of Children* 6(1):4–24.
- Toscano G, Windau J [1994]. The changing character of fatal work injuries. *Monthly Labor Rev* 118:17–28.
- Toscano G, Windau J [1995]. National census of fatal occupational injuries, 1994. Compensation and working conditions. Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics, September.
- University of North Carolina Injury Prevention Research Center [1995]. State wage and hour division recommends tightening NC child Labor regulations. *IPRC News* 7(2):4–5.
- U.S. Chamber of Commerce [1991]. 1991 analysis of workers' compensation laws. Washington, DC: U.S. Chamber of Commerce.
- USC. United States Code. Washington, DC: U.S. Government Printing Office.
- Venning PJ, Walter SD, Stitt LW [1987]. Personal and job-related factors as determinants of incidence of back injuries among nursing personnel. *J Occup Med* 29(10):820–825.
- Wagner MM, Blackorby J [1996]. Transition from high school to work or college: how special education students fare. *The Future of Children* 6(1):103–120.
- Zuckerman BS, DUBY JC [1985]. Developmental approach to injury prevention. *Pediatr Clin North Am* 32(1):17–29.

APPENDIX A

CHARGE TO THE NIOSH CHILD LABOR WORKING TEAM*

In April 1992, Dr. Millar addressed the Childhood Agricultural Injury Prevention Symposium with the question: "Who will save the children?" While Dr. Millar was speaking of the children who work on farms, this is an equally important question for the children who work in other sectors of the workforce. I know the problem of child labor is not simple, and for too long the magnitude of the problem of work-related injuries to children has not been appreciated. Efforts to prevent these injuries will require the combined efforts of NIOSH, regulators, medical providers, educators, and employers. I believe NIOSH must take an active role in the prevention of work-related injuries and illness among our Nation's youth. NIOSH has played a central role over the past decade in rediscovering the problem of injuries and illness associated with child labor. That is why I am asking your team to assess current research and prevention activities in the Federal Government (including the Departments of Health and Human Services, Labor, Agriculture, Education, and others as appropriate), State government, and universities with the goal of identifying research, surveillance, and intervention actions to be undertaken for the prevention of injuries and illness that limit the health, well being, or potential of our working youth in this country. As Champion for your working team, I look forward to your recommendations on this very important subject.

*Richard A. Lemen, Ph.D., Deputy Director of NIOSH, April 11, 1994.

APPENDIX B

NIOSH CHILD LABOR WORKING TEAM MEMBERSHIP

NIOSH Members

Heinz Ahlers, Education and Information Division (EID)

Dawn Castillo, Division of Safety Research (DSR)—Leader

John Decker, Division of Surveillance, Hazard Evaluations, and Field Studies (DSHEFS)

Janet Ehlers, DSHEFS

John Fajen, DSHEFS

William Halperin, DSR

David Hard, DSR

E. Lynn Jenkins, Office of the Director (OD)

Deborah Landen, DSR

Jane Lipscomb, OD

Larry Mazzuckelli, DSHEFS

John Palassis, EID

Teri Palermo, Division of Respiratory Disease Studies (DRDS)

Ted Scharf, Division of Biomedical and Behavioral Science (DBBS)

Ray Sinclair, EID

Nancy Stout, DSR

Joann Wess, EID

Mary Lynn Woebkenberg, Division of Physical Sciences and Engineering (DPSE)

Members from Other Federal Agencies

Margarett Davis, Division of Adolescent and School Health, National Center for Chronic Disease Prevention and Health Promotion, CDC, DHHS

William Fern, Wage and Hour Division, Employment Standards Administration, DOL

Judith Gilbert, School-to-Work Office, DOL and U.S. Department of Education

Art Kerschner, Jr., Wage and Hour Division, Employment Standards Administration, DOL

**Bradley K. Rein, Cooperative State Research, Education and Extension Service,
U.S. Department of Agriculture**

**Cathy Wasem, Office of Rural Health Policy, Health Resources and Services
Administration, DHHS**

APPENDIX C

EXPERT PRESENTATIONS TO NIOSH CHILD LABOR WORKING TEAM

*Federal Child Labor Regulation
and Enforcement*

Art Kerschner, Jr., and William Fern, Wage
and Hour Division, DOL

*Available Data from the National Center
for Health Statistics (NCHS)*

Felicia LeClere, NCHS

*Available Data from the Bureau
of Labor Statistics*

Larry Leith, BLS, DOL

*Research on How to Educate Youth
about Workplace Health and Safety*

Robin Baker, University of California at
Berkeley

School-to-Work

Ron Castaldi and Jack Repoire, Department of
Education

Judith Gilbert, School-to-Work Office, De-
partments of Education and Labor

OSHA's Role with Respect to Child Labor

John Solheim, OSHA

*Washington State's Child Labor
Regulatory Efforts*

Suzanne Mager and Mary Miller, Washington
Department of Labor and Industries

Survey of Injured Adolescent Workers

Dawn Castillo, NIOSH

APHA Policy Statement on Child Labor

Mary Miller, Washington Department of Labor
and Industries

*Office of Rural Health Policy
(ORHP) Activities*

Colleen Hennessy, ORHP, HRSA, DHHS

Psychosocial Aspects of Adolescent Work

Mike Shanahan, University of North Carolina

Psychosocial Aspects of Adolescent Work

Larry Steinberg, Temple University

Sleep-Related Concerns for Child Labor

Mary Carskadon, Brown University Medical
School

NIH-Funded Survey of Adolescent Health

Susan Newcomer, National Institute of Child
Health and Human Development, National In-
stitutes of Health

*Cooperative State Research, Education, and Exten-
sion Service (CSREES) Activities*

Brad Rein, CSREES, U. S. Department of Ag-
riculture.

Childhood Agricultural Injury Prevention

Barbara Lee, National Farm Medicine Center

Review of NIOSH Agriculture Program

Teri Palermo, NIOSH

Occupational Health Nurses in Agricultural Communities Program

Janet Ehlers, NIOSH

Washington State Agricultural Regulations

Suzanne Mager, Washington Department of Labor and Industries

Minnesota FACE Investigations of Child Fatalities

David Parker, Minnesota Department of Health

Farm Stress Injury Model and Expected Consequences for Adolescent Family Members

Ted Scharf, NIOSH

Emerging Issues and Changing Nature of Agriculture—Update on National Committee Report to the Secretary of HHS

Sue Bernstein, ORHP, HRSA, DHHS

Coordinated School Health Programs

Margarett Davis, Peter Hunt, and Laura Kann, Division of Adolescent and School Health, National Center for Chronic Disease Prevention and Health Promotion, CDC, DHHS

Industrial Hygiene Surveys at Vocational Schools

John Fajen, NIOSH

Safety and Health Training for Vocational Teachers and Administrators

John Palassis, NIOSH

Enhancing Young Workers' Safety and Health through Community Education Efforts

Ray Sinclair, NIOSH; Letitia Davis, Massachusetts Department of Public Health

Youth Focus Groups on Occupational Safety and Health

Letitia Davis, Massachusetts Department of Public Health

Occupational Safety and Health Research Needs for Children and Adolescents

Kenneth Kolash, National Safety Council

Occupational Safety and Health Research Needs for Children and Adolescents

Larry Offut, Burger King Corporation

Occupational Safety and Health Research Needs for Children and Adolescents

Rosco Vaughn and Brian Daniel, National Council of Agricultural Education

Occupational Safety and Health Research Needs for Children and Adolescents

Dorianne Beyer, National Child Labor Committee

Occupational Safety and Health Research Needs for Children and Adolescents

Keith Mestrich, AFL-CIO and Child Labor Coalition

Development of Educational Materials for Teens in Massachusetts

Robin Dewey, Massachusetts Department of Public Health

Health Hazards Survey in Teen Workplaces

Elise Morse, Massachusetts Department of Public Health

APPENDIX D

NATIONAL OBJECTIVES FOR THE OCCUPATIONAL SAFETY AND HEALTH OF YOUTHS

The following materials illustrate the national objectives of both Federal and non-Federal agencies involved in the occupational safety and health of youths. Included are excerpts from various publications and Acts of Congress.

Joint Declaration on Health Education for Children

[Shalala and Tsaregorodtsev 1996]

The following declaration was signed November 2, 1995, and issued January 26, 1996, by Donna Shalala (Secretary of the U.S. Department of Health and Human Services) and Alexander Tsaregorodtsev (Russian Minister of Health and Medical Industry):

As chairpersons of the Health Committee of the United States—Russia Joint Commission on Science and Technology, we address the leaders and citizens of our two nations on the important subject of health education for the children who will be citizens of the 21st century.

We affirm that:

The health of children in the present and their prospects for healthy lives in the future as adults depend on caring families, good nutrition, sufficient physical exercise, protection from hazards, and access to appropriate medical care; in addition, children must have basic knowledge and understanding to be able to develop habits and behaviors that build, rather than destroy, good health.

Our challenge as nations is to assure educational and community environments in which our children can attain the fundamental knowledge on which to build healthy lives and can engage in activities that support the development of healthy habits and patterns of life.

Therefore, we call upon our fellow citizens in the United States and the Russian Federation:

To make health education a priority for our educational systems, defining health education broadly to engage families, communities, and educational and health institutions in the

transmission of essential information about life sciences and risks to health, as well as in provision of opportunities to engage in health-supporting activities and to live their childhoods in health-sustaining environments.

To support necessary training of the people who teach children in schools and who provide health services to them in clinics and hospitals, in order that they may transmit sound information and provide effective educational experiences to the children with whom they work.

To support and enhance health-related research, through our respective research institutions at each level of government, in order to seek new knowledge of the causes of disease, measures to prevent illness and injury, and effective ways to achieve our educational goals.

We call especially on our fellow professional leaders in fields of education and pedagogy, medicine and health:

To make a commitment to expand and improve the quality of health education provided to our nations' children as one of the fundamental obligations of our professions.

To accept and affirm our own roles as health educators, as an essential part of whatever specific work that we do.

To make our common goal, linking together our professional fields of endeavor and the organizations and systems in which we serve, to achieve healthy American and Russian children who are growing and learning to become healthy adults.

Finally, we affirm our own responsibility as health leaders of our two nations by endorsing these principles on behalf of the Department of Health and Human Services of the United States of America and the Ministry of Health and Medical Industry of the Russian Federation.

Healthy People 2000

[DHHS 1994]

- Reduce work-related injury rates among adolescent workers to 3.8 per 100 full-time workers.
- Increase to at least 75% the proportion of the Nation's elementary and secondary schools that provide planned and sequential kindergarten through 12th grade quality school health education.
- Provide academic instruction on injury prevention and control, preferably as part of quality school health education, in at least 50% of public school systems.

- Establish community health promotion programs that separately or together address at least three of the Healthy People 2000 priorities and reach at least 40% of each State's population.

School-to-Work Opportunities Act

[Public Law 103–239]

- To improve the knowledge and skills of youths by integrating academic and occupational learning, integrating school-based and work-based learning, and building effective linkages between secondary and postsecondary education.
- A School-to-Work Opportunities program under this Act shall provide participating students, to the extent practicable, with strong experience in and understanding of all aspects of the industry the students are preparing to enter. The term “all aspects of an industry” includes planning, management, finances, technical and production skills, underlying principles of technology, labor and community issues, health and safety issues, and environmental issues, related to such industry or industry sector.

Goals 2000—Educate America Act

[Public Law 103–227]

- All workers will have the opportunity to acquire the knowledge and skills, from basic to highly technical, needed to adapt to emerging new technologies, work methods, and markets through public and private educational, vocational, technical, workplace, or other programs.

Carl D. Perkins Vocational and Applied Technology Education Act

[Public Law 101–392]

- It is the purpose of this Act to make the United States more competitive in the world economy by developing more fully the academic and occupational skills of all segments of the population. This purpose will principally be achieved through concentrating resources on improving educational programs leading to academic and occupational skill competencies needed to work in a technologically advanced society.
- States desiring to receive funds shall submit a plan which includes an analysis of “. . . the capability of vocational education programs to provide vocational education students, to the extent practicable, with—” “strong experience in and understanding of all aspects of the industry the students are preparing to enter (including planning, management, finances, technical and production skills, underlying principles of technology, labor and community issues, and health, safety, and environmental issues)”

Centers for Disease Control and Prevention Priorities

[CDC 1996a]

- CDC's newest priority focuses on the vulnerability of our youth to adopt unhealthy behaviors leading to disease, death, and societal problems. Scientific evidence indicates that we can intervene with young people to prevent them from adopting these unhealthy behaviors. This investment in the health and safety of our youth today will pay health and economic dividends to our nation tomorrow.

National Occupational Research Agenda

[NIOSH 1996b]

- **Priority Research Area: Special Populations at Risk.** Occupational hazards are known to be distributed differentially, and workers with specific biologic, social, and/or economic characteristics are more likely to have increased risks of work-related diseases and injuries.

Children and Agriculture: Opportunities for Safety and Health: A National Action Plan

[National Committee for Childhood Agricultural Injury Prevention 1996]

- Establish and maintain a national system for childhood agricultural injury prevention
- Establish that childhood agricultural injury prevention programs are supported with sufficient funding and cooperation from the public and private sectors
- Establish guidelines for children's and adolescents' work in the industry of agriculture
- Ensure that the public is aware of general childhood agricultural safety and health issues
- Establish and maintain a comprehensive national database of fatal and nonfatal childhood agricultural injuries
- Conduct research on costs, risk factors, and consequences associated with children and adolescents who participate in agricultural work
- Use systematic evaluation to ensure that educational materials and methods targeted toward childhood agricultural safety and health have demonstrated positive results
- Ensure that farm and ranch owners/operators, farm workers, parents, and caregivers understand relevant agricultural safety and health issues that pertain to children and adolescents
- Ensure that rural safety and health professionals understand the issues relevant to children and adolescents exposed to agricultural hazards

- Influence adult behaviors which affect protection of children and adolescents through the *use of incentives and adoption of voluntary safety guidelines*
- Provide a protective and supportive environment for children exposed as bystanders to agricultural hazards
- Establish uniform standards that address protection of children and adolescents from agricultural occupational hazards

Childhood Risks Involving Tractors

[National Safety Council 1996]

- The Council urges appropriate agencies and professionals to identify and implement effective strategies and for manufacturers to implement appropriate design features to decrease the *proportion of children's injuries that involve tractors in operation.*
- Currently, there is little research data available on appropriate age, cognitive and physical development required for the operation of tractors by youths. There is also little data on the effectiveness of current programs that educate youth in the safe operation of tractors and other farm equipment. The Council encourages studies in these areas so that more reliable data can be developed.

Protection of Child and Adolescent Workers

[APHA 1995]

- Recommends that existing child labor regulations be reviewed periodically to update and expand prohibited duties based on research findings and knowledge about adolescent development capabilities, and where appropriate, reduce the number of allowable work hours and adjust quitting times.
- Recommends that Federal and State labor departments and public health agencies work with youth educators to incorporate health and safety training into school curricula and that States involved in the School-to-Work Opportunities Act of 1994 include comprehensive health and safety training modules in their curricula.
- Recommends that more resources be provided to improve data sources, expand research activities, and identify intervention strategies leading to prevention.
- Encourages the coordination of public health efforts with the U.S. Department of Labor and Department of Health and Human Services to control and prevent workplace injuries among minors through efforts that improve education and training about the hazards associated with work for children and adolescents for educators, parents, teens, employers, health care providers, occupational safety and health professionals, and others in the field of public health.

Child Labor Update and Recommendations for Action

[Child Labor Coalition 1993]

- **Gather more data on industries/work- places/processes currently covered and review those which have only become prominent since the inception of the FLSA and the Hazardous Occupation Orders, but that, based upon an examination of injuries/accidents/ illnesses, seem to be detrimental to youth.**
- **Solving our child labor problems requires a comprehensive, multi-agency approach. Linkages among government agencies will promote information-sharing, creative problem-solving, and joint efforts and initiatives.”**



Delivering on the Nation's promise:
Safety and health at work
For all people
Through research and prevention

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