Chapter 6.
Occupational Injuries, Illnesses, and Fatalities

The Report on the Youth Labor Force was revised in November 2000.

Introduction and Overview

This chapter provides a statistical profile of risks to the safety and health of working youths. This information is important because the intent of much of the regulation of youth employment is to limit the exposure of working children to the risks of injury and death. Federal and State laws prohibit employment of youths in high-risk activities, such as driving, or operating other types of machinery. (More information on the Federal and State regulation of job risks encountered by youths is provided in chapter 2.)

A number of studies have addressed the problems of safety and health of young people on the job.[1] This chapter supplements this knowledge by presenting selected data on serious work injuries incurred by youths. The Bureau of Labor Statistics regularly collects data on serious work injuries of youths, but published data are usually restricted to the age group 16 to 19. This chapter includes previously unpublished BLS data on work injuries that either result in the death of a a youth, or require him or her to stay away from work to recuperate from the injury. Employment also can have serious long-term effects on health that are not immediately evident. For example, workers, whether young or old, may be exposed to high noise levels on the job that result in hearing loss later in life.[2] Our statistical profile does not include information on job risks with long latency periods.

The second section reviews sources of information about workplace injuries of youths generally, as well as more detailed information about the Bureau's statistics used to construct the profile. Data on fatalities to youths in the workplace are collected in the BLS Census of Fatal Occupational Injuries (CFOI), an annual census covering all sectors of the U.S. economy. Annual data on injuries to youths resulting in lost workdays are collected in the BLS Survey of Occupational Injuries and Illnesses (SOII) for wage and salary workers in private industry. After reviewing what these data show about the characteristics of youth fatalities and lost workday injuries in the next two sections, the final section assesses the risks of injuries and illnesses to working youths compared to workers aged 25 to 44.

Profile summary for occupational fatalities

The BLS Census of Fatal Occupational Injuries shows that occupational fatalities to youths 17 and under varied between 62 and 70 per year from 1992 to 1998. For this period, 89 percent of these deaths occurred to young males; 29 percent of youths killed on the job were under the age of 15. Thirty percent of occupational fatalities among youths occurred while they were working in a family business, and a very high percentage of these fatalities—43 percent—occurred in agriculture.

To assess the risks of an occupational fatality to youths, the occupational fatality data for 15- to 17-year-olds and for workers aged 25 to 44, were compared with estimates of hours worked from the Current Population Survey (CPS) for these labor force groups. (Unfortunately, there are few sources of information on hours worked to assess the risks to workers under 15 years of age.) These data indicate that the entire labor force of 15- to 17-year-olds, on average, incurred a risk of an occupational fatality per hour of work that was about 80 percent of the corresponding risk for the older workers. Agricultural employment is particularly dangerous work; youths aged 15 to 17 who have jobs in agriculture had a risk of a fatality that was more than 4.4 times as great as the average worker aged 15 to 17. The data also indicate that youths in agriculture face about the same risks of an occupational fatality as do adults aged 25 to 44 working in agriculture. The high concentration of youth fatalities in agriculture is also partly accounted for by the relatively longer hours they work in agriculture than elsewhere in the economy.

The estimates of risk of an occupational fatality to two relatively small groups of young workers also bear noting. First, youths in construction jobs had a risk of an occupational fatality per hour worked that was about twice the corresponding risk to all workers aged 25 to 44 in the construction industry during the period 1994 to 1998. Second, youths who were self-employed or working in a family business had a risk of an occupational fatality that was at least 4 times as great as that of other youths, regardless of industry.

Profile summary of lost work-time injuries

Data from the Survey of Occupational Injuries and Illnesses on the charac-

teristics of injuries among youths that result in days away from work cover only wage and salary jobs in private industry and in large agricultural establishments. Almost all (97.3 percent) of these injuries to youths occurred to 16- or 17-year-olds. A summary measure of the severity of these injuries, median lost workdays, was about 4 days throughout the period 1992-97. Injuries to young workers resulting in lost workdays declined rapidly from 1995 to 1997; in 1997, such worktime injuries among youths comprised less than 1 percent of these injuries for the labor force as a whole. Commonly, these injuries include sprains, strains, and tears (more prevalent among young women) and cuts and lacerations (more prevalent among young men). Over the period 1992-97, the severity of lost workday injuries to young women became more similar to the severity of injuries to young men.

The distribution of lost workday injuries among youths generally follows the distribution of employment; more than 80 percent of these injuries occurred in either the retail trade or services industries in the 1992-97 period. Looking at variation in the risk of a lost worktime injury per hour worked among these industries, such risks were about 3 times as high in health services as in all retail trade and services jobs, on average.

BLS Sources of Information on Workplace Injuries of Youths

Comprehensive national data programs providing information on occupational injuries for youths separately were not developed until 1992. Since then, national data for youths have been available annually from two BLS programs: the Census of Fatal Occupational Injuries and the Survey of Occupational Injuries and Illnesses. Since 1972, the SOII has reported annually on the number of workplace injuries and illnesses in private industry and the frequency of those incidents. With the 1992 survey, BLS be-

gan collecting additional information on the more seriously injured or ill workers in the form of worker and case characteristics, including age. At that time, BLS also initiated a separate Census of Fatal Occupational Injuries to count fatalities more effectively than had been possible in the SOII.

CFOI is a Federal-State cooperative program, implemented in all 50 States and the District of Columbia. To compile counts that are as complete as possible, the census uses multiple sources to identify, verify, and profile fatal worker injuries. Information about each workplace fatality—occupation and other worker characteristics, equipment involved, and circumstances of the event—is obtained by cross referencing the source records, such as death certificates, workers' compensation reports, and Federal and State agency administrative reports. To ensure that fatalities are work-related, cases are substantiated with two or more independent source documents, or a source document and a follow-up questionnaire.

Establishments surveyed by SOII are asked to provide additional information for a sample of injuries in the workplace in the past year that involved at least 1 day away from work, beyond the day of injury or onset of illness. Employers provide several types of information about these cases, including the demographics of the worker disabled, the nature of the disabling condition, and the event and source producing that condition. There are several limitations of this survey

that are important for the measurement of work injuries to youths. Excluded from survey coverage are Federal, State and local governments, the self-employed and workers in their own family businesses, and agricultural enterprises with fewer than 11 employees. As shown in previous chapters, agriculture and family businesses are an important source of jobs for youths. The threshold for inclusion of cases in these data, not being able to return to work on the "next regular workday," may be higher for young workers as they are much more likely to work part time than is the rest of the labor force.

Characteristics of Work-related Youth Fatalities, 1992 to 1998

CFOI data indicate that an average of 67 work-related deaths per year occurred among youths under 18 over the period 1992 to 1998. (In contrast, the average annual number of occupational fatalities to all other workers—those 18 years or older—between 1992 and 1998 was 6,208.) Chart 6.1 shows only slight variation in youth fatalities, which hovered around the upper 60s during most of the period, except for 1997, when they dropped to the lower 60s. However, the total number of hours worked by youths has increased substantially over this period, so that the risk of a fatality occurring—per hour worked—has declined. In particular, analysis of unpublished CPS data indicates that total hours worked among 15- to 17-year-olds in-

Chart 6.1. Occupational fatalities of workers aged 17 years and younger, 1992-98
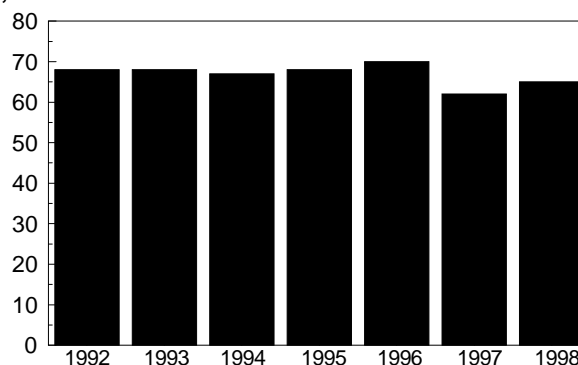
SOURCE: Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

creased by about 38 percent from 1992 to 1998. (Occupational fatalities also occur to youths under 15 years of age, but we have no information on hours worked to gauge the risk of a fatality for them.) Because the absolute numbers of occupational fatalities among youths are small, this chapter analyzes the characteristics of the total number of fatalities over 1992–98.

Table 6.1 presents data on selected characteristics of youths who died on the job over the 1992–98 period. These workers were predominantly males, about 89 percent of the total. Eighty-five percent of these workers were identified as white, and Hispanics represented 14 percent of the total youth fatalities. About 30 percent of the youth fatalities occurred while the deceased was working in family businesses. It is not possible to assess whether these fatalities are disproportionate to their representation in the labor force, as many of these workers are under 15 years of age. The CPS does not provide labor force participation data for youths younger than 15 and the National Longitudinal Survey of Youth does not cover the period of interest here. As shown in table 6.1, about 29 percent of occupational fa-

Table 6.1. **Fatal occupational injuries to youths under age 18 by selected worker characteristics, 1992–98**

Characteristics	Counts	Percent
Sex		
Males	416	88.9
Females	52	11.1
Race/ethnicity		
White	399	85.3
Black	26	5.6
Asian or		
Pacific Islander	11	2.4
Other	32	6.8
Hispanic origin	67	14.3
Employee status		
Wage and salary		
workers	311	66.5
Self-employed or family		
business	157	33.5
Working in family		
business	141	30.1
Age		
Under 15	134	28.6
15	54	11.5
16	100	21.4
17	180	38.5
15 to 17	334	71.4

NOTE: Percentages may not add to totals because some categories are omitted.

Table 6.2. **Occupational fatalities among youths under age 18 by major industry division, 1992–98**

Total	Youths under 18		All 18 and older	
	Counts	Percent	Counts	Percent
Agricultural, forestry, and fishing	200	42.7	5,595	12.9
Construction	64	13.7	7,195	16.6
Manufacturing	24	5.1	5,169	11.9
Transportation and public utilities	12	2.6	6,514	15.0
Wholesale trade	14	3.0	1,757	4.0
Retail trade	90	19.2	4,854	11.2
Services	38	8.1	5,355	12.3

SOURCE: BLS Census of Fatal Occupational Injuries.

talities among youths under the age of 18 occurred among these very young workers.

Industry concentrations of occupational fatalities

Table 6.2 shows that the distribution of occupational fatalities among youths by industry contrasts sharply with the industry distribution of fatalities for all other workers. About three-fourths of the deaths of youths were concentrated in three industries: Agriculture, construction, and retail trade. As discussed below, these concentrations are only partly explained by industry concentrations of youth employment and hours worked; agriculture and construction youth employment, in particular, is associated with a high risk of a fatality. BLS has profiled youth fatalities in each of these three industries for the period 1992 to 1997.[3]

The characteristics of youth job fatalities in agriculture are quite distinctive in a number of ways. In agriculture they are more likely to occur among the youngest workers. About three-quarters of all deaths to young workers under the age of 15 occurred in agriculture, representing more than half of youth fatalities in agriculture.[4] About three-quarters of occupational fatalities in self-employed jobs were in the agricultural industries. More than half of the deaths in agriculture occurred in family businesses. Family farms are exempt from OSHA safety requirements.[5]

The most common cause of death of youths in agriculture is from farm machinery, such as a harvester or tractor. For example, the cases of work-

related youth fatalities in Minnesota between 1994 and 1997 chronicled in the attached box illustrate the kinds of dangers youths can encounter in working with farm machinery. Nationwide, over the 1992–97 period, 51 deaths of youths in agriculture could be specifically attributed to involvement with tractors; in about half of these cases a tractor overturned on the youths.[6]

As shown in previous chapters, jobs in the retail trade industries, such as restaurants, grocery stores, or shops and department stores comprise one of the largest parts of youth employment. Of the total fatalities among youth in retail trade between 1992 and 1998, about two-thirds were homicides. Analysis of the circumstances of these homicides suggests that robberies were probably the cause of from one-fourth to one-half of all youth fatalities in retail trade.[7] Incidents involving transportation while working, such as highway crashes, were the next most frequent cause, accounting for 18 percent of youth fatalities in retail trade.

Table 6.2 shows that, nationwide, more work-related fatalities are reported in the construction industry than in other industries. Analysis of the fatalities of youths in construction indicates that the majority of these deaths occurred among those employed as construction laborers, particularly for special trade contractors (for example, roofing or concrete work) during the summer months.[8] The three most common events or exposures associated with these youth fatalities, comprising about 60 percent of the 64 deaths, were falls (such as

from roofs or skylights), electrocutions, and being struck by objects—particularly falling objects.[9]

Similarities in types of work-related fatalities between youths and older workers

Given the distinctive industry concentration of young workers, it might be expected that the types of events (for example, highway collision) or exposure (for example, electrocution) that are primarily associated with youth occupational fatalities would differ from breakdowns for older workers. However, across all industries the distribution of fatalities by event of exposure for young workers is fairly similar to those of all other workers.[10] Because occupational fatalities among youths are concentrated in agriculture, retail trade, and construction, comparisons

within these industries are also useful to examine. These comparisons are shown in table 6.3.

Transportation incidents (including collisions, overturned vehicles, or being struck by a vehicle) are a somewhat more frequent cause of fatalities for young workers in agriculture and construction than for other workers, but this is not the case for retail trade. Among these three industries, categorization of fatalities by event or exposure is most dissimilar between youths and other workers in construction. In retail trade, the preponderant cause of death is "assaults and violent acts." Somewhat surprisingly, the proportion of occupational fatalities among retail workers that are homicides is virtually identical among both younger and older workers—about two-thirds of all fatalities in each group.

Characteristics of Injuries and Illnesses with Lost Work Days, 1992–97

In 1997, the Survey of Occupational Injuries and Illnesses estimated that there were 11,248 cases of injuries resulting in lost workdays to private industry wage and salary workers aged 17 and younger, about 0.6 percent of the total of all such cases (1,833,380) in 1997. (See table 6.4.) Almost all these injuries to youths in 1997—97.3 percent—occurred among 16- and 17-year-olds. A summary measure for the severity of these injuries, the median days of work missed as a result of the injury, indicates that, overall, young workers have had less severe injuries than other workers have. Median workdays lost were 4 days for young workers, but 5 days for all other work-

Table 6.3. **Distribution of fatal occupational injuries by event or exposure in agriculture, retail trade, and construction, 1992-98**

Event or exposure, by industry	Youths under 18		18 and older	
	Number	Percent	Number	Percent
Agriculture:				
Total, all events	200	100.0	5,594	100.0
Transportation incidents[1]...............................	114	57.0	2,847	50.9
Assaults and violent acts[2].............................	12	6.0	369	6.6
Contact with objects or equipment[3]...............	45	22.5	1,289	23.0
Falls[4]...	6	3.0	418	7.5
Exposure, harmful substances or environment[5]...	18	9.0	576	10.3
Retail trade:				
Total, all events	90	100.0	4,854	100.0
Transportation incidents[1]...............................	16	17.8	985	20.3
Assaults and violent acts[2].............................	61	67.8	3,267	67.3
Contact with objects or equipment[3]...............	5	5.6	192	4.0
Falls[4]...	3	3.3	174	3.6
Exposure, harmful substances or environment[5]...	4	4.4	145	3.0
Construction:				
Total, all events	64	100.0	7,195	100.0
Transportation incidents[1]...............................	20	31.3	1,826	25.4
Assaults and violent acts[2].............................	–	–	222	3.1
Contact with objects or equipment[3]...............	16	25.0	1,351	18.8
Falls[4]...	16	25.0	2,288	31.8
Exposure, harmful substances or environment[5]...	12	18.8	1,286	17.9

[1] Includes highway collisions, overturned vehicle, fall from vehicle, or struck vehicle.
[2] Includes homicides and assaults by animals.
[3] Includes being struck by object, caught in or compressed by equipment or collapsing materials.
[4] Includes falling down stairs, from loading docks, roofs, or scaffolding.
[5] Includes contact with electric current (electrocution), drowning, exposures to toxic substances.
NOTE: Dash indicates data not available.
SOURCE: BLS Census of Fatal Occupational Injuries.

Table 6.4. **Nonfatal occupational injuries and illnesses with days away from work by age, 1992-97**

Year	Total, all ages	All, 17 and younger	Ages 16 and 17
1992	2,331,098	22,121	20,783
1993	2,252,591	21,620	20,708
1994	2,236,639	23,131	21,884
1995	2,040,929	19,507	18,625
1996	1,880,525	15,156	13,647
1997	1,833,380	11,248	10,946
Cumulative percent change, 1992–97 ..	−21,35	−49.15	−47.33

SOURCE: BLS Survey of Occupational Injuries and Illnesses.

Table 6.5. **Lost worktime injuries by industry, youths aged 17 and under, 1992 and 1997**

Industry	1992		1997	
	Number	Percent	Number	Percent
Total	20,783	100.0	10,946	100.0
Retail trade	14,161	68.1	7,658	70.0
Services	3,682	17.7	1,906	17.4
Manufacturing	1,046	5.0	454	4.1
Wholesale trade	488	2.3	288	2.6
Construction	323	1.6	233	2.1
Rest of private sector[1]..	1,083	5.2	407	3.7

[1] Includes mining, transportation and public utilities, finance, insurance and real estate, and agriculture establishments with more than 11 employees.

SOURCE: BLS Survey of Occupational Injuries and Illnesses.

ers. The industry distribution of these injuries among young workers roughly follows the concentration of their wage and salary employment; more than 80 percent of these injuries occurred in either retail trade or services employment.[11]

1992–97 trends

Chart 6.2 shows how lost workday injuries among youths have changed from 1992 to 1997. The cumulative percent decline from 1992 to 1997 was 49 percent, but these injuries did not start to decline until 1995 and then decreased rapidly to 1997. In part, these declines reflect a trend toward an increase in workplace safety, as lost workday cases of those 18 and older also experienced a decline over the 1992-97 period. (See table 6.4.) Nevertheless, lost workday cases among youths have decreased more rapidly than the older group's and were a significantly smaller share of all lost workday cases in 1997 than 6 years earlier, despite the fact that, over this period, employment grew more among youths than among older workers.[12]

The reduction in lost worktime injuries among youths between 1992 and 1997 occurred in all major industries. Over this 6-year period, these injuries fell by almost half with little change in industry concentration. As table 6.5 shows, 70 percent of injuries occurred in retail trade establishments in 1997 and an additional 17 percent occurred in service industries that year. The industry concentration was similar in 1992. In the services industries, more than half the injuries occurred in health services and amusement and recreation (for example, amusement parks).[13]

Comparisons of severity of injuries

In the sampling of characteristics of injuries, SOII obtains the number of days away from work, thus providing an indicator of the severity of the injury. Table 6.6 compares the distribution of these days away from work be-

Chart 6.2. Occupational injuries resulting in lost work days, private wage and salalry workers aged 17 and younger, 1992–97

Number of workers

[Bar chart showing number of workers from 1992 to 1997. Values: 1992 ≈ 22,000; 1993 ≈ 21,500; 1994 ≈ 23,000; 1995 ≈ 19,500; 1996 ≈ 15,000; 1997 ≈ 11,000]
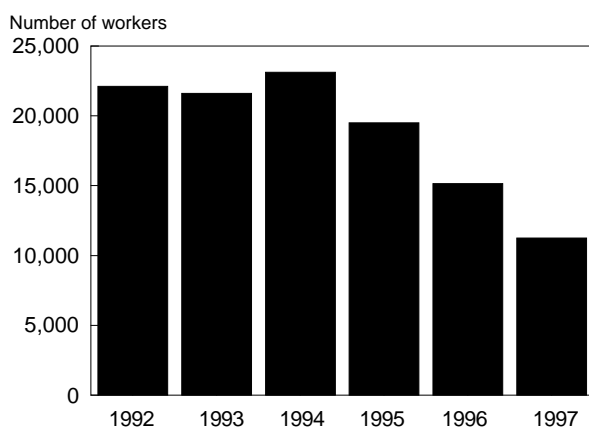
SOURCE: Bureau of Labor Statistics, Survey of Occupational Injuries and Illnesses.

tween youths and adults, and between male and female youths. These data indicate that injured adult workers have tended to lose more workdays than injured youths, and that the severity of all lost worktime injuries—but not those of youths—fell between 1992 and 1997.[14] In 1997, about 25 percent of all workers with lost workdays were away from work for more than 20 days (4 weeks or more on a full-time schedule), whereas about 10 percent of employed youths experienced this number of lost workdays. However, these data may overstate the relative severity of adult work injuries because youths are more likely to have short duration jobs or work intermittent schedules than adults. Twenty or more lost workdays represent a longer period of recuperation for workers on intermittent schedules, and injured workers with short duration jobs may have not had the opportunity to work many additional days.

Comparisons of the severity of injuries between young male and female workers may be less problematic. Their variation in the numbers of days away from work became more similar by 1997. In 1992, lost workday cases among young women were likely to result in just 3 median days away from work, compared with 4 days for young men. In 1997, both male and female youths experienced about 4 median days of lost worktime.

Common types of injuries among youths

The most frequent single type of injury resulting in lost worktime among youths under 18 is a muscle sprain, strain, or tear, usually resulting from overexertion in lifting a heavy or bulky object.[15] These injuries often do not need acute care; in contrast, the most common types of work-related injuries among youths reported in emergency room statistics are cuts and lacerations, often resulting from use of knives or other cutting instruments.[16] Table 6.7 provides a breakdown of lost workday injuries among youths for common types of injuries in 1997. In that year, sprains, strains and tears occurred more frequently during female youths' (37 percent) worktime than during that of male youths (22 percent). In contrast, cuts and lacerations were more common among male youths.

Characteristics of more severe types of injuries among youths

Table 6.6 shows that most common types of injuries are associated with relatively low median lost workdays. However, to monitor job safety among young workers it is also important to have information on the more severe work injuries, even if these injuries are relatively uncommon. For example, although lost workday injuries lasting more than 30 days were only 4.8 percent of all lost workday cases among

youths in 1997, they may entail a considerable amount of pain and suffering. Even ignoring pain and suffering, given the distribution of lost workdays by severity for 1997, the total foregone earnings of youths from lost workdays is at least 3 times greater for injuries resulting in 30 lost workdays or more than for injuries lasting a combined 1 or 2 days.[17]

The Survey of Occupational Injuries and Illnesses also provides information on the characteristics of more severe and less common injuries. Each case in the survey is coded using four different classifications: Nature of the disabling condition, the event or exposure associated with the injury, the part of the body affected, and the source directly producing the disability. Thus, the case "nurse sprains her back while lifting her patient" would be assigned four classification codes: "sprains" (for nature of disabling condition), "back" (part of body affected), "lifting" (event or exposure), and "patient" (source directly producing the disability).

The relatively small sample of cases of serious injuries among youths limits the value of examining combinations of these conditions in a given year. Analysis of pooled survey results for the years 1992 through 1997 indicates that the two combinations of event and nature of injury included at least 400 cases having median lost workdays exceeding 10 over this 6-year period. The SOII survey results indicate that there were 419 cases classified as falls from ladders that resulted in bruises and contusions; these injuries had median lost workdays of 20. There were also 460 cases classified as caught or compressed by equipment or objects that resulted in fractures; these injuries had median lost workdays of 14.

Inferences from BLS Data on the Comparative Risks to Employed Youths

There are various approaches to assessing the risks of injuries and illnesses to working youths. One ap-

Table 6.6. **Percent distribution of cases resulting in days away from work by number of days and gender, 1992 and 1997**

Days away from work	All workers		Males, under age 18		Females, under age 18	
	1992	1997	1992	1997	1992	1997
All cases (number)	2,331,098	1,833,380	13,447	6,678	8,517	4,478
1	15.7	16.6	18.4	18.9	22.7	17.2
2	12.9	13.0	14.1	16.2	15.1	17.9
3 to 5	20.4	20.4	24.4	31.9	30.4	35.0
6 to 10	13.6	13.1	17.4	12.0	13.9	12.7
11 to 20	11.4	11.7	10.5	11.2	8.6	8.1
21 to 30	6.4	6.7	5.9	4.4	3.8	5.2
More than 31	19.7	18.5	9.3	5.4	5.4	3.8
Median days away from work	6	5	5	4	3	4

SOURCE: BLS Survey of Occupational Injuries and Illnesses.

Table 6.7. **Common types of lost work day injuries by gender, 1997**

Nature of injury	Males, under 18			Females, under 18		
	Number	Percent	Median days	Number	Percent	Median days
Fractures	415	4.9	5	151	3.4	4
Sprains, strains, tears	1,902	22.3	5	1,675	37.4	4
Cuts, lacerations	1,227	14.4	4	239	5.3	5
Bruises, contusions	659	7.7	3	769	17.2	3
Heat burns, scalds	743	8.7	5	507	11.3	5
All other natures	3,571	41.9	–	1,137	25.4	–
Total cases	8,517	100.0	4	4,478	100.0	4

NOTE: Dash indicates data not reported or data do not meet publication criteria.
SOURCE: BLS Survey of Occupational Injuries and Illnesses.

proach would be to compare the safety of youths at work to their safety in *other* activities and locations. During their time at work, youths may be prevented from engaging in riskier activities, such as driving, and protected from risk of criminal assaults. We do not investigate this approach other than to note that, although injuries are a leading cause of death among youths, there are relatively few occupational fatalities. For example, in 1995 there were 6,622 accidental deaths from all causes (including assaults and gunshot wounds) among youths aged 15 to 19.[18] In contrast, there were 194 occupational fatalities, about 3 percent of all accidental deaths among 15- to 19-year-olds that year.

Another approach involves total counts of work injuries, but, by themselves, these do not provide much information about job risks. Additional information on the number of hours worked on the job (as a measure of the length of exposure to risk) is useful because having both types of information could allow calculation of a rate of injuries incurred per time worked. To compare injury risks of young workers with those of older workers, it is preferable to use data on total hours worked rather than employment counts because youth usually work considerably fewer hours per week and fewer weeks per year than adults. For nonfatal injuries, BLS collects data from establishments on hours worked along with information on injuries, allowing calculation of injury rates by industry, employment size, or geographic area.[19] However, the hours worked data are obtained only for the establishment's entire labor force, and thus cannot be broken down by the age of worker.

Because injury rates can not be directly calculated for young workers,

the comparisons of job risk presented in this chapter link the injury data by age to hours worked data from the Current Population Survey (CPS), a monthly survey of the U.S. labor force.[20] (See chapter 4.) CPS data indicate that using employment data to calculate injury rates overstates the relative amount of time youths are exposed to risks at work. For example, unpublished tabulations of CPS data indicate that, in 1997, 16- and 17-year-olds in the U.S. labor force worked, on average, 19.1 hours a week, less than half of the average for all workers (39.5 hours). Because the injuries that occur to youths do so with fewer hours worked on the job, comparing injuries per worker for youths to those for adults in full-time work may understate the relative risks faced by youths on the job.

The availability of hours worked data provides the possibility of measuring the *absolute* risk of employment, in the form of the expected number of injuries, or risk of a fatality, per a specified number of hours worked. Instead we follow another approach[21] in making *relative* comparisons of employment risks between youths in different jobs or industries, or with older workers in similar employment situations. This approach proposes calculation of "indexes of relative risk" that compare the risk of injury per hour worked in the particular group of workers being studied to a reference group. The formula for the index of relative risk reduces to comparing two ratios, the ratio of injuries in the study group to those in the reference group, and the respective ratio of hours worked between the two groups.[22] If the index of relative risk exceeds 1, the study group has had a disproportionate share of injuries relative to the share of hours worked in the reference group.

This report uses estimates of injuries and hours worked by two reference groups to assess occupational injury risks of youths. The two groups are: adult workers 25 to 44 years of age, and employed youths 15 to 17 years of age. We compare injuries of

the youths to those of 25- to 44-year-olds because previous research has shown that occupational fatality rates increase substantially for workers older than 44; with the infirmities of age, older workers are less likely to survive work injuries.[23] Using the first reference group helps to answer the question: Are injury rates for youths lower than those for able-bodied adults in similar employment situations? Using the second reference group helps to answer the question: How do injury rates of youths vary in different employment situations?

Estimates of hours worked by youths

To compare hours worked of youths in different employment situations and with hours worked by prime-age workers, data from the CPS from 1994 to 1998 were used. Second jobs are often important in the employment of youths, such as when a youth works two part-time jobs in the summer. Since 1994, information on second jobs (such as the industry where employed) has been regularly collected in the CPS. Hours worked for various labor force groups were totaled for employment experiences over the 60 survey weeks covered by the CPS over the 5-year period 1994-98.[24]

Several characteristics of the measurement of hours worked in the CPS may limit the accuracy of comparisons of employment risks using these data. The most important limitation is that information on hours worked is collected in the CPS only for the survey week including the 12th of the month. Summing up hours worked for the year yields a total for the 12 survey weeks, whereas injuries occur every week during the year. Thus, during the month of December, temporary work by youths over the winter school holidays is not likely to be captured in the monthly survey of labor force participation. Another significant limitation for the purpose of the employment risk comparisons is that the CPS samples only hours worked by those who are 15 years or older, whereas lost worktime injuries and occupational fatalities also occur to younger workers. The age cutoff limitation especially affects the assessment of youth fatalities in agriculture, where about one-half of the youth fatalities occurred among workers under the age of 15.

Occupational fatality risks to youths

Although the number of occupational fatalities to youths is small, a sizable proportion has occurred either in agriculture (table 6.2) or among those working in family businesses (table 6.1). The data in table 6.8 show distributions of occupational fatalities and hours worked estimates by major economic sector and class of worker for 1994 to 1998. Note that although a youth can work in different sectors of the economy over the course of the year, or hold two jobs at the same time in different sectors, the hours worked estimates from the CPS account for this variability. Panel A of table 6.8 presents these data for 15- to 17-year-old youths; panel B presents the corresponding data for adult workers aged 25 to 44 in the same employment groups. Panel A indicates that 88 percent of all worktime of youths over the 1994-98 period was spent in wage and salary jobs in private industry, compared with 6.3 percent of all work hours spent in agricultural jobs. (Youths having agricultural jobs work more hours per week than do youths in jobs outside agriculture.) The distribution of hours worked for youths is significantly different from that of the adult workers shown in panel B; adult workers spend relatively few hours in agriculture jobs and more in government jobs than do youths.

Table 6.9 uses the data displayed in table 6.8 to calculate the two in-

Table 6.8. **Hours worked estimates and occupational fatalities among youths and adults in agriculture, nonagriculture, and government, 1994-98**

Class and industry of worker	Occupational fatalities[1]		Hours worked estimates[2]	
	Number	Proportion	Number	Proportion
A. Hours worked estimates and fatalities for youths, aged 15 to 17				
Private sector:				
Total, labor force aged 15 to 17	239	100.0	3,157.0	100.0
Agriculture:				
Total	67	28.0	199.1	6.3
Wage and salary	41	17.2	134.0	4.2
Self-employed and family workers	26	10.9	65.1	2.1
Nonagriculture:				
Total	162	67.8	2,825.9	89.5
Wage and salary	146	61.1	2,776.9	88.0
Self-employed and family workers	16	6.7	49.0	1.6
Government:				
Total	10	4.2	133.0	4.2
B. Hours worked estimates and fatalities for adults, aged 25 to 44				
Private sector:				
Total, labor force aged 25 to 44	14,734	100.0	157,713.9	100.0
Agriculture:				
Total	1,325	9.0	4,136.1	2.6
Wage and salary	758	5.1	2,360.0	1.5
Self-employed and family workers	567	3.9	1,776.1	1.1
Nonagriculture:				
Total	11,764	79.8	133,162.0	84.4
Wage and salary	10,338	70.2	122,656.0	77.8
Self-employed and family workers	1,426	9.7	10,506.0	6.7
Government:				
Total	1,645	11.1	20,415.8	12.9

[1] Tabulations from the Census of Fatal Occupational Injuries.
[2] Hours worked estimates (millions of hours) are the sum of hours worked in 60 survey weeks for a subsample of Current Population Survey data that includes information on second jobs.

Table 6.9. **Indexes of relative risk of occupational fatalities among youths aged 15 to 17 and adults aged 25 to 44 by major sector and class of worker, 1994–98**

Adults, 25 to 44	Reference group	
	Youths, 15 to 17	Adults, 25 to 44
Total	1.00	0.81
Private industry		
Agriculture:		
Total	4.45	1.05
Wage and salary	4.04	0.95
Self-employed and family workers	5.28	1.25
Nonagriculture:		
Total	0.76	0.65
Wage and salary	0.69	0.62
Self-temployed and family workers	4.31	2.41
Government		
Total	0.99	0.93

SOURCE: Calculated from data presented in table 6-8 with methodology adapted from John W. Ruser, "A Relative Risk of Analysis of Workplace Fatalities," *Compensation and Working Conditions,* January 1995.

Table 6.10. **Occupational fatalities, hours worked, and indexes of relative risk for construction by selected age group, 1994-98**

Age group	Occupational fatalities[1]	Hours worked estimates[2] (in millions)
A. Fatalities and hours worked		
Youths, 15 to 17:		
Levels	48	87.5
Share of total	20.1	2.8
Adults, 25 to 44:		
Levels	3,000	11,000
Share of total	20.4	7.0
B. Indexes of relative risk in construction [3]		
Reference group:		
Youths, 15 to 17 in all jobs	7.18	
Adults, 25 to 44 in construction jobs	2.01	

[1] Tabulations from the Census of Fatal Occupational Injuries.

[2] Hours worked estimates (millions of hours) are the sum of hours worked in 12 survey weeks for a subsample of Current Population Survey data that includes information on second jobs.

[3] Indexes of relative risk adapted from John W. Ruser, "A Relative Risk of Analysis of Workpace Fatalities," *Compensation and Working Conditions*, January 1995.

dexes of risks of an occupational fatality among youths. In the first column, the index compares the risk of a fatality per hour worked in a particular economic sector and class-of-worker status with the average risk incurred by all working youths over the 1994–98 period. For example, data in the first row of the first column shows that the risk of a fatality (per hour worked) in an agricultural wage and salary job is over 4 times as great as the average risk for all working youths. Most working time of youths is spent in relatively safe wage and salary jobs outside agriculture, hav-

ing an index of risk of only 0.69. Contributing to the higher average rate for all youths is the high risk of a fatality for youths working in family businesses, whether or not these jobs are in agriculture (with an index of 5.28) or outside agriculture (having an index of 4.31).

The second column of table 6.9 compares the fatality risk of youths' work with that of adults having the same sector and class-of-worker status. For most youths—those who have wage and salary jobs outside agriculture—the risk of a fatality is substantially less than that for adults 25 to 44

years old who are also in wage and salary jobs outside agriculture, with an index of 0.62. The average risk of an occupational fatality for youths overall is somewhat higher, but still an index of only 0.81 of the risk to adults overall. These data also indicate that the risks of a fatality to youths working in agriculture are very close to the corresponding risks to prime-age adults working in agriculture.

Not shown in table 6.9 is how the risk of an occupational fatality varies by industry outside agriculture. As table 6.10 shows, occupational fatalities in construction accounted for about one-fifth of all job-related fatalities among youths over the 1994-98 period, even though only 2.8 percent of their work hours were spent in construction employment. In part, this concentration is due to the greater risk of injury or illness for both youths and adults, as about one-fifth of all occupational fatalities among adults aged 25 to 44 also occurred in construction. Nevertheless, hours worked by youth aged 15 to 17 in the construction industry are a much smaller share of all hours worked by youths than the corresponding share is for adults. The CPS hours worked estimates indicate that the risk of an occupational fatality per hour worked was about twice as high (that is, it had an index of relative risk of 2.01) for youths as for adults working in construction in the period 1994-98.

Risk of lost worktime injuries

The scope of the BLS Survey of Occupational Injuries and Illness is limited to wage and salary workers and covers only larger agricultural employers. Consequently, risk assessments using the lost worktime injury data are restricted to comparisons among the industries in which wage and salary jobs of youths are concentrated. Table 6.11 compares the distribution of lost worktime injuries and estimates of hours worked in 1997 for youths aged 16 and 17 in the six industries employing most of them: Eating and drinking places, food stores, general merchandise stores, health

Table 6.11. **Lost worktime injuries and hours worked estimates for 16- to 17-year-olds, 1997**

Industry of worker	Lost worktime injuries[1]			Hours worked estimates[2]	
	Number	Percent	Median work days lost	Number	Percent
Eating and drinking	3,867	46.5	4	200.0	52.8
Food stores	2,103	25.3	3	85.3	22.5
General merchandise	977	11.7	3	27.9	7.4
Health services	784	9.4	4	11.5	3.0
Amusement and recreation	412	5.0	2	42.8	11.3
Business services	173	2.1	3	11.2	3.0

[1] Tabulations from the BLS Survey of Occupational Injuries and Illnesses.

[2] Current Population Survey data, for wage and salary workers only, in millions of hours.

services, amusement and recreation, and business services.[25] In these industries, the lost worktime injuries among 16- and 17-year-olds comprised more than three-quarters (75.9 percent) of all lost worktime injuries to youths in this age group.

Among these industries, the share of lost worktime injuries incurred in eating and drinking, food stores, and business services was roughly proportional to their representation of hours worked. However, the risk of a lost worktime injury per hour worked in health services was about 3 times that for these industries, on average. Also, the high median workdays lost in health services among youths indicate that injuries tend to be more severe than in the other industries examined here. In contrast, youths employed in amusement and recreation had, on average, only half the risk of a lost worktime injury that their counterparts in the other industries had, and the injuries tended to be less severe, as indicated by the low median of 2 lost workdays.

Anthony Barkume, a reasearch economist with the Bureau of Labor Statistics (BLS), had primary responsibility for preparation of this chapter. John Bishow, Linda Garris, Eric Sygnatur, and Mark Zak, all of BLS, prepared tabulations. John Ruser, Guy Toscano, and Janice Windau of BLS and Dawn Castillo of the National Institute for Occupational Safety and Health reviewed early drafts and provided comments and suggestions.

[1] Reviews of recent research of job safety among youths are given by National Academy of Sciences, Committee of the Health and Safety Implications of Child Labor in *Protecting Youth at Work: Health, Safety, and Development of Working Children and Adolescents in the United States* (Washington, National Academy Press, 1998); and by Dawn N. Castillo, Letitia Davis, and David Wegman, "Young Workers," in *Occupational Medicine,* July-September 1999, pp. 519-36.

[2] *Protecting Youth at Work*, p. 84.

[3] Janice Windau, Eric Sygnatur, and Guy Toscano, "Profile of work injuries incurred by young workers," *Monthly Labor Review,* June 1999, pp. 3–10.

[4] Windau, Sygnatur, and Toscano, p. 6.

[5] For more details, see chapter 2 of this report.

[6] Windau, Sygnatur, and Toscano, p. 5.

[7] Ibid., p. 6.

[8] Ibid., p. 7.

[9] Ibid., p. 7.

[10] Ibid., p. 5.

[11] Ibid., p. 9.

[12] The higher rate of growth of employment among youths since 1992 is in part due to the relatively more severe impact that the 1990-92 recession had upon job opportunities for youths.

[13] Windau, Sygnatur, and Toscano, p. 8.

[14] Changes in the age distribution of workers having lost workday injuries may have contributed to these developments.

[15] Windau, Sygnatur, and Toscano, p. 8.

[16] *Protecting Youth at Work*, p. 7.

[17] A numerical example can help to illustrate this point. Suppose total lost worktime injuries are 10,000, cases having a duration of 1 day are 18 percent of the total, cases having 2 days are 16 percent, and cases with more than 30 days are 5 percent. Then, total lost worktime associated with 1-day cases are 1,800 workdays, total lost workdays associated with 2-day cases are 3,200, but the total lost worktime associated with cases with more than 30 lost workdays would be more than 15,000. Thus, total lost worktime of the most serious cases, more than 15,000, is more than 3 times the lost worktime of the combined 1- and 2-day cases.

[18] *National Vital Statistics Report*, November 1998.

[19] These rates are published as rates per 100 full-time workers employed for a year. The methodology for their derivation is provided in *BLS Handbook of Methods*, Bulletin 2490 (Bureau of Labor Statistics, April 1997), p. 74.

[20] An extensive set of comparisons of job risk by occupation, age and nature of injury that uses CPS data is provided in chapter 3 of the *Report of the American Workforce* (U.S. Department of Labor, 1994).

[21] See John W. Ruser, " A relative risk analysis of workplace fatalities," *Compensation and Working Conditions*, January 1995, pp.18-22.

[22] *Report on the American Workforce*, 1994, p. 112.

[23] See Dawn N. Castillo and Bonita D. Malit, "Occupational injury deaths of 16- and 17-year-olds in the U.S.: trends and comparisons with older workers," *Injury Prevention,* vol. 3, 1997, pp. 277-81.

[24] In summing hours worked, the hours worked by a particular survey respondent were weighted by their sample weight. Also, to identify the characteristics of second jobs only a subsample of the CPS (the outgoing rotation group sample) was used in the calculations.

[25] See table 4.9.