Flavor manufacturers and flavored-food producers are widely distributed in the United States. Bronchiolitis obliterans has been identified in microwave-popcorn workers in several states, including Missouri, Iowa, Ohio, New Jersey, and Illinois; bronchiolitis obliterans in flavor-manufacturing workers has been identified in Ohio, California, Maryland, and New Jersey. Although the risk for occupational lung disease has been established in the microwave-popcorn industry (*1,2*) and improvements have been made (e.g., isolating processes, increasing exhaust ventilation, and using respirators), the risk for occupational lung disease associated with the use of flavorings during production of other types of food has not been established. Additional information for physicians treating workers with respiratory disease who have been exposed to flavoring chemicals is available at http://www.cdc.gov/niosh/topics/flavorings, and assistance is available from NIOSH, OSHA programs, and state health departments.

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Nonfatal Occupational Injuries and Illnesses — United States, 2004

Data collected through a National Electronic Injury Surveillance System occupational supplement (NEISS-Work) provide information on persons treated for nonfatal work-related injuries and illnesses in U.S. hospital emergency departments (EDs). CDC's National Institute for Occupational Safety and Health uses these data to monitor injury trends and aid prevention activities. This report summarizes 2004 NEISS-Work injury and illness surveillance data. In 2004, an estimated 3.4 million nonfatal ED-treated injuries and illnesses occurred among workers of all ages, with a rate of 2.5 cases per 100 full-time equivalent (FTE) workers aged ≥15 years. Workers aged <25 years had the highest injury/illness rates. More than three fourths of all nonfatal workplace injuries/illnesses were attributed to contact with objects or equipment (e.g., being struck by a falling tool or caught in machinery), bodily reaction or exertion (e.g., a sprain or strain), and falls. No substantial reduction was observed in the overall number and rate of ED-treated occupational injuries/illnesses during 1996–2004 (*1–3*). To reduce occupational injuries/illnesses, interventions should continue to target workers at highest risk and reduce exposure to those workplace hazards with the greatest potential for causing severe injury or death. More emphasis should be placed on prevention-effectiveness studies and dissemination of successful interventions to reduce work-related injuries and illnesses.

NEISS-Work uses a national stratified probability sample of 67 U.S. hospitals with 24-hour EDs.* Hospitals in the sample were selected from the approximately 5,300 rural and urban U.S. hospitals after stratification into four size-based strata (i.e., by total annual ED visits) plus a children's hospital stratum. Each injury/illness was assigned a statistical weight correlating to the probability of selecting the treating hospital within its sample stratum. Weights were adjusted monthly for nonresponse among the sample hospitals and on an annual basis for national fluctuations in ED usage. ED-usage adjustments for 2004 were derived from a sampling frame of national hospital ED visits in 2003.

* The NEISS-Work data collection system is operated by the Consumer Product Safety Commission (CPSC) as a supplement to its NEISS surveillance of consumer product–related injuries. CPSC product-related injury estimates exclude work-related injuries. NEISS-Work estimates include all work-related injuries regardless of product involvement. NEISS-Work uses approximately two thirds of the CPSC sample of 101 hospitals. Because of hospital closures and other nonparticipation/nonresponse factors, the number of reporting hospitals can vary monthly and yearly.

Nonfatal occupational injuries/illnesses among civilian noninstitutionalized workers treated in the sample hospital EDs were identified by chart review. An injury or illness was considered work related if it occurred while the patient was working for pay or other compensation, working on a farm, or volunteering for an organized group (e.g., volunteer fire department) (*3*). Most cases involved injuries; illnesses (e.g., occupational asthma, conjunctivitis, and myocardial infarction) requiring ED treatment of patients amounted to approximately 5%–10% of all cases. Common illnesses (e.g., colds or other viral infections) or revisits to the same ED by a previously treated worker were excluded.

National injury/illness estimates were calculated by summing the statistical weights assigned to cases. Injury/illness rates were calculated on an FTE basis (i.e., 2,000 hours worked annually = one FTE) using employment estimates from the U.S. Current Population Survey, which includes workers aged ≥15 years (*4*). Thus, in this report, the number of injuries/illnesses is reported for all ages, whereas rates for workers treated in EDs are calculated for persons aged ≥15 years. Ninety-five percent confidence intervals (CIs) were calculated using a variance procedure that accounted for the stratified nature of the sample and monthly fluctuations in hospital reporting.

The total estimated number of injuries/illnesses for which workers were treated in EDs in 2004 was 3.4 million (Table 1), the same as estimated in 2003; the total rate of 2.5 cases per 100 FTEs in 2004 also was the same as in 2003. In 2004, the median ages for injured/ill males and females were 34 and 36 years, respectively. Workers aged 25–54 years accounted for 70% of all injuries/illnesses. However, among age groups, workers aged 18–19 years had the highest rate (5.7 cases per 100 FTEs [CI = ±1.6]), followed by workers aged 15–17 years (4.5 cases [CI = ±1.0]), and workers aged 20–24 years (4.4 cases [CI = ±1.4]). Workers aged 25–44 years (2.7 cases [CI = ±0.6]) had an intermediate rate, and workers aged 45 years and older (1.7 cases [CI = ±0.4]) had the lowest injury/illness rate (Table 2). Overall, approximately 2% of workers treated at EDs were either admitted to the hospital or transferred to another hospital (e.g., trauma or burn center). Males accounted for 68% of the injuries and illnesses for which workers were treated and released but 85% of the workers requiring hospital admission.

Approximately 53% of all injuries/illnesses were categorized as sprains and strains or lacerations, punctures, amputations, and avulsions (Table 1). The majority of sprains and strains affected the trunk (i.e., shoulder, back, chest, or abdomen) (517,600 [CI = ±178,800]) and lower extremities (i.e., legs, feet, or toes) (233,100 [CI = ±64,800]). The majority of lacerations, punctures, amputations, and avulsions affected upper extremities (i.e., arms, hands, or fingers) (647,700 [CI = ±145,800]). Overall, dislocations and fractures accounted for 7% of the injuries/illnesses. However, dislocations and fractures (caused mostly by falls) produced 40% of hospitalizations for males (26,900 [CI = ±8,400]) and 33% of hospitalizations for females (4,300 [CI = ±1,500]).

Males and females had similar rates for fall-related injuries/illnesses overall and by age group (Figure). Fall rates were highest among workers in the youngest and oldest age groups; rates among women aged ≥65 years were particularly high (0.64 per 100 FTEs [CI = ±0.16]). Fifty-five percent of falls were on the same level (e.g., falling to a floor, a walkway, or the ground or onto/against objects such as a desk, wall, or door) (291,200 [CI = ±78,800]); 32% of falls were to a lower level (e.g., falling from a ladder or roof; falling down stairs or steps; falling through a floor or roof) (165,600 [CI = ±39,900]).[†] Females had six times more falls on the same level (165,000 [CI = ±43,700]) compared with falling to a lower level (28,200 [CI = ±7,200]). However, males had about an equal number of falls to a lower level (137,400 [CI = ±34,600]) and falls on the same level (126,200 [CI = ±36,500]).

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Editorial Note: The findings in this report indicate that, in 2004, the number (3.4 million) and rate (2.5 per 100 FTEs) of nonfatal occupational injuries/illnesses were similar to previous years (3.2, 3.6, and 3.4 million in 1996, 1998, and 2003, respectively; rates of 2.7, 2.9, and 2.5 per 100 FTEs in 1996, 1998, and 2003, respectively)[§] (*1–3*). Focusing on common events that often produce severe injuries (e.g., falls) can substantially reduce fatalities, hospitalizations, and the number of injuries/illnesses overall. A previous analysis of falls among workers aged ≥55 years determined that injuries sustained by older workers tended to be more severe, with a greater number of fractures and hospitalizations from falls on the same level. (*6*). Many falls on the same level involved floor contamination (e.g., with water, cleaning solutions, or grease) or tripping hazards that can be addressed in the workplace by keeping walking surfaces clean and dry, well lit, and free from cords and debris.

The Bureau of Labor Statistics (BLS) reports nonfatal occupational injuries/illnesses estimates annually based on a

[†] The total number of falls also included 1) falls, unspecified, 2) falls, jumps to a lower level, and 3) falls, not elsewhere classified.

[§] 1996 data were adjusted for a 1997 change in the NEISS-Work sample.

TABLE 1. Estimated number of persons treated for nonfatal occupational injuries and illnesses in hospital emergency departments, by sex and selected characteristics — National Electronic Injury Surveillance System (NEISS-Work), United States, 2004

Characteristic	Male			Female			Total		
	No. (1,000s)	(95% CI)* (1,000s)	(%)	No. (1,000s)	(95% CI) (1,000s)	(%)	No. (1,000s)	(95% CI) (1,000s)	(%)
Total†	**2,347**	**(±583)**	**(100)**	**1,071**	**(±261)**	**(100)**	**3,418**	**(±835)**	**(100)**
Age group (yrs)									
≤14	3	(±2)	(<1)	—§	—	—	4	(±2)	(<1)
15–17	31	(±8)	(1)	19	(±4)	(2)	50	(±11)	(1)
18–19	103	(±28)	(4)	48	(±15)	(4)	151	(±42)	(4)
20–24	380	(±125)	(16)	158	(±47)	(15)	538	(±170)	(16)
25–34	682	(±188)	(29)	258	(±71)	(24)	940	(±256)	(28)
35–44	584	(±127)	(25)	256	(±57)	(24)	840	(±181)	(25)
45–54	376	(±80)	(16)	216	(±48)	(20)	592	(±126)	(17)
55–64	151	(±37)	(6)	93	(±25)	(9)	245	(±60)	(7)
≥65	38	(±8)	(2)	21	(±6)	(2)	58	(±12)	(2)
Diagnosis (selected)									
Lacerations, punctures, amputations, and avulsions	672	(±157)	(29)	187	(±38)	(17)	859	(±193)	(25)
Sprains and strains	574	(±195)	(24)	375	(±109)	(35)	949	(±302)	(28)
Contusions, abrasions, and hematomas	378	(±97)	(16)	213	(±50)	(20)	591	(±145)	(17)
Dislocations and fractures	197	(±43)	(8)	59	(±15)	(5)	256	(±57)	(7)
Burns	72	(±16)	(3)	28	(±7)	(3)	100	(±22)	(3)
Body part affected									
Head and neck	452	(±109)	(19)	153	(±33)	(14)	604	(±139)	(18)
Trunk	530	(±154)	(23)	303	(±81)	(28)	834	(±232)	(24)
Upper extremities	893	(±221)	(38)	377	(±105)	(35)	1,270	(±322)	(37)
Lower extremities	411	(±104)	(18)	199	(±46)	(19)	611	(±147)	(18)
More than 25% of body	51	(±14)	(2)	32	(±10)	(3)	83	(±22)	(2)
Emergency department disposition,¶ by event**									
Treated and released††	**2,261**	**(±579)**	**(100)**	**1,051**	**(±260)**	**(100)**	**3,313**	**(±831)**	**(100)**
Contact with objects and equipment§§	1,082	(±285)	(48)	286	(±69)	(27)	1,368	(±352)	(41)
Falls¶¶	298	(±76)	(13)	202	(±51)	(19)	500	(±125)	(15)
Bodily reaction and exertion***	496	(±161)	(22)	337	(±99)	(32)	833	(±258)	(25)
Exposure to harmful substances or environments	168	(±38)	(7)	117	(±28)	(11)	285	(±62)	(9)
Transportation incidents	72	(±19)	(3)	18	(±6)	(2)	90	(±24)	(3)
Fires and explosions	23	(±7)	(1)	3	(±1)	(<1)	25	(±8)	(1)
Assaults and violent acts	84	(±19)	(4)	72	(±19)	(7)	156	(±36)	(5)
Hospitalized††	**68**	**(±17)**	**(100)**	**13**	**(±3)**	**(100)**	**80**	**(±20)**	**(100)**
Contact with objects and equipment	25	(±6)	(36)	2	(±1)	(13)	26	(±6)	(32)
Falls	18	(±6)	(27)	4	(±1)	(32)	22	(±6)	(28)
Bodily reaction and exertion	7	(±3)	(10)	3	(±1)	(26)	10	(±3)	(13)
Exposure to harmful substances or environments	5	(±2)	(7)	—	—	—	5	(±2)	(7)
Transportation incidents	8	(±4)	(11)	—	—	—	9	(±4)	(11)
Fires and explosions	—	—	—	—	—	—	—	—	—
Assaults and violent acts	—	—	—	—	—	—	3	(2)	(4)

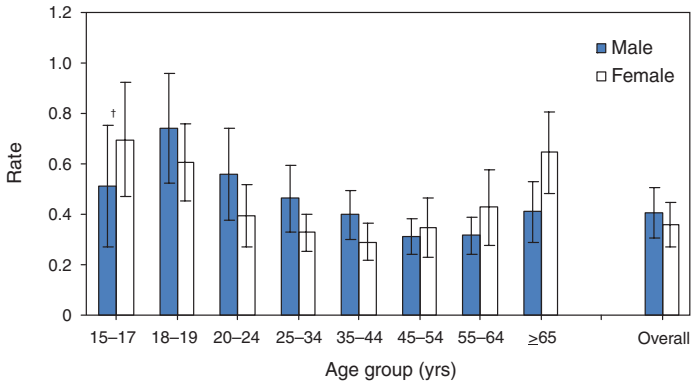
* Confidence interval.
† Totals include workers of unknown age and sex; in addition, numbers and percentages might not add to totals or 100 because of rounding.
§ Did not meet NEISS-Work minimum reporting requirements because the number was too small, the coefficient of variation exceeded 33%, or both.
¶ Disposition includes treated and released; hospitalized or transferred to another facility; and other dispositions not shown (e.g., held for observation and left without being seen = 25,000 [95% CI = ±10,000]).
** Event or exposure per Bureau of Labor Statistics Occupational Injury and Illness Classification System (*5*).
†† Totals include cases with event unspecified.
§§ Struck by, struck against, caught in, crushed by, or rubbed/abraded by an object, equipment, or surface; excludes falls.
¶¶ Excludes slips, trips, and loss of balance without a fall.
*** Injury/illness from free bodily motion, excessive physical effort, or repetition of a bodily motion; usually nonimpact; includes slips/trips without a fall.

TABLE 2. Rate* of nonfatal occupational injuries and illnesses among workers treated in hospital emergency departments, by sex and age group — National Electronic Injury Surveillance System (NEISS-Work), United States, 2004

Age group	Male		Female		Total†	
(yrs)	Rate	95% CI§	Rate	95% CI	Rate	95% CI
Total	**3.0**	**±0.7**	**1.9**	**±0.5**	**2.5**	**±0.6**
15–17	5.6	±1.5	3.5	±0.8	4.5	±1.0
18–19	7.0	±2.0	4.0	±1.3	5.7	±1.6
20–24	5.5	±1.8	2.9	±0.9	4.4	±1.4
25–34	3.7	±1.0	2.1	±0.6	3.1	±0.8
35–44	2.8	±0.6	1.7	±0.4	2.4	±0.5
45–54	2.0	±0.4	1.5	±0.3	1.8	±0.4
55–64	1.6	±0.4	1.3	±0.3	1.5	±0.4
≥65	1.7	±0.4	1.4	±0.4	1.6	±0.3

* Per 100 full-time equivalent workers aged ≥15 years.
† Includes cases with unknown sex; cases with unknown age are excluded.
§ Confidence interval.

FIGURE. Rate* of nonfatal occupational fall-related injuries and illnesses among workers treated in hospital emergency departments, by age group and sex of worker — National Electronic Injury Surveillance System (NEISS-Work), United States, 2004



* Per 100 full-time equivalent workers aged ≥15 years.
† 95% confidence intervals.

survey of private industry employers (*7*).¶ BLS results indicate a general decline in private industry nonfatal injuries/illnesses in recent years. Despite differences between NEISS-Work and BLS surveillance (e.g., in worker populations, types of medical treatment, sample sizes, and data sources), analogous results were observed for fall injuries. The BLS reported that, in 2004, for nonfatal cases involving 1 or more days away from work, falls were the third most common cause, accounting for 255,600 (20%) of 1,259,320 injuries/illnesses. The majority of these falls occurred on the same level (65%, 167,010) or to a lower level (31%, 79,800) (*8*). Education and health services, along with the leisure and hospitality industries, had the highest rate of falls on the same level (0.27 per 100 FTEs), whereas the construction industry had the highest rate of falls to a lower level (0.33 per 100 FTEs). For workers aged ≥55 years, falls were the second leading injury/illness event for cases involving days away from work (32%, 48,730 of 152,760 cases), with the majority of falls occurring on the same level (75%, 36,310 of 48,730 cases). Although direct data comparisons must be made with caution, these two national data systems can augment each other in guiding nonfatal occupational injury/illness prevention.

The findings in this report are subject to at least five limitations. First, the NEISS-Work data only address injuries/illnesses for which workers are treated in EDs; these are estimated to represent about one third of all workplace injuries/illnesses for which persons require medical treatment (*3*). Second, NEISS-Work includes only a proportion of work-related illnesses; the majority of workers with chronic illnesses are not treated in an ED, and the work-relatedness of illnesses such as arthritis, cancer, or high blood pressure is difficult to establish. Third, work-related cases were identified from ED charts and hospital admissions information. Additional documentation (e.g., workers' compensation claims) was not required to confirm that injuries/illnesses were work related and might have resulted in an overestimation; conversely, a lack of incident detail or a clear association with a work-related cause in ED charts and economic disincentives for patients to identify their injuries/illnesses as work related might have resulted in underestimation. Fourth, patient demographics, nature or severity of injury, and incident-event characteristics might have biased the identification of work-related cases, affecting the distribution of these characteristics. Finally, the large standard errors (10%–20%) resulting from the hospital sample size might have obscured injury/illness trends.

These findings indicate that the rate of workers treated in an ED for nonfatal occupational injuries/illnesses has not declined substantially in the United States in recent years. Younger workers aged <25 years continued to experience the highest rates of injuries/illnesses. NEISS-Work is used to track progress toward a *Healthy People 2010* objective, which targets a 30% reduction in the rate of workers aged 15–17 years who are treated in an ED for occupational injuries and illnesses.**

¶ The BLS survey includes cases that meet Occupational Safety and Health Administration criteria for reportable work-related nonfatal injuries and illnesses that involve days away from work, job transfer or restriction, loss of consciousness, or medical treatment other than first aid. All federal, state, and local government workers (certain states include state and local workers), self-employed workers, private household workers, and workers on farms with fewer than 11 employees are excluded (approximately 22% of U.S. workers). The BLS survey provides occupational injury and illness counts and rates by detailed industry. The survey only reports demographic and case characteristics for cases involving days away from work. Rates are available for selected case characteristics; rates for demographic characteristics are being developed.

** Objective 20-02h: reduce work-related injuries among adolescent workers from a 1997–1998 baseline of 4.9 injuries per 100 full-time equivalent workers to 3.5. Available at http://www.healthypeople.gov/data/midcourse/pdf/FA20.pdf.

To attain this objective, better safety training for these young workers might help overcome inexperience, improve attitudes toward risk, and lead to safer work habits later in life. The U.S. Department of Labor is proposing changes to child labor regulations to improve safety for young workers (*9*). To address some of the more severe nonfatal injuries and illnesses, safety practices and interventions must more effectively target workers and work practices at highest risk. For example, targeting hazards such as slippery surfaces, pathway obstacles, or tripping dangers, particularly in food service or health care, can reduce serious falls (*10*). Integrating workplace fall-prevention programs with community-based initiatives for older adults that address indoor and outdoor factors such as lighting, floor and walkway surfaces, and railings might further reduce hospitalization rates among older workers and benefit business customers and visitors. The effectiveness of all safety practices should be evaluated carefully and take into account the demographics of the worker population at risk.

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Lead Exposure Among Females of Childbearing Age — United States, 2004

For centuries, exposure to high concentrations of lead has been known to pose health hazards, and evidence is mounting regarding adverse health effects from moderate- and low-level blood lead concentrations. Public health authorities use higher levels to define blood lead levels (BLLs) of concern in nonpregnant females (≥25 μg/dL) compared with children (≥10 μg/dL) and a lower level (≥5 μg/dL) for pregnant females (*1–3*). This difference in levels for nonpregnant and pregnant females has raised concern because of the recognition that a proportion of nonpregnant females with BLLs ≥5 μg/dL will become pregnant and potentially expose their infants to a risk for adverse health effects from lead. Maternal and fetal BLLs are nearly identical because lead crosses the placenta unencumbered (*4*). This report summarizes 2004 surveillance data regarding elevated BLLs among females of childbearing age (i.e., aged 16–44 years) in 37 states participating in CDC's Adult Blood Lead Epidemiology and Surveillance (ABLES) program. The results indicated that rates of elevated BLLs ranged from 0.06 per 100,000 females of childbearing age at BLLs of ≥40 μg/dL to 10.9 per 100,000 females at BLLs of ≥5 μg/dL. Primary and secondary prevention of lead exposure among females of childbearing age is needed to avert neurobehavioral and cognitive deficits in their offspring.

ABLES tracks laboratory-reported BLLs in persons aged ≥16 years who have been tested through workplace monitoring programs or on the basis of clinical suspicion of lead exposure; BLLs are reported for both occupational and nonoccupational exposures.* The Occupational Safety and Health Administration (OSHA) mandates BLL testing of all persons working in areas where airborne lead exceeds a certain level. States participating in ABLES require all laboratories to report BLL results. The lowest reportable BLL varies by state. During 2004, a total of 37 states participated in ABLES. These states all reported BLL rates of ≥25 μg/dL and ≥40 μg/dL. Ten of the 37 states also reported BLLs of any level, enabling these states to calculate prevalences of persons with BLLs ≥5 μg/dL and ≥10 μg/dL, in addition to the two higher levels.

To assess the prevalence of elevated BLLs in females of childbearing age, ABLES data for 2004 were analyzed at four different BLLs: 1) 5 μg/dL, the level at or above which the

* Additional information regarding the ABLES program is available at http://www.cdc.gov/niosh/topics/ables/ables.html.

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Workers' Memorial Day — April 28, 2007

Workers' Memorial Day, April 28, was established to recognize workers who died or were injured on the job. On average, nearly 16 workers in the United States die each day from injuries sustained at work (*1*), and 134 die from work-related diseases (*2*). Daily, an estimated 11,500 private-sector workers have a nonfatal work-related injury or illness, and as a result, more than half require a job transfer, work restrictions, or time away from their jobs (*3*). Approximately 9,000 workers are treated in emergency departments each day because of occupational injuries, and approximately 200 of these workers are hospitalized (*4*). In 2004, workers' compensation costs for employers totaled $87 billion (*5*).

Workers' Memorial Day 2007 also will commemorate the thirty-sixth anniversary of the creation of the National Institute for Occupational Safety and Health in the U.S. Department of Health and Human Services and the Occupational Safety and Health Administration in the U.S. Department of Labor. Additional information on workplace safety and health is available online at http://www.cdc.gov/niosh/homepage.html or by telephone, 800-356-4674.

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Fixed Obstructive Lung Disease Among Workers in the Flavor-Manufacturing Industry — California, 2004–2007

Bronchiolitis obliterans, a rare and life-threatening form of fixed obstructive lung disease, is known to be caused by exposure to noxious gases in occupational settings and has been described in workers in the microwave-popcorn industry who were exposed to artificial butter-flavoring chemicals, including diacetyl (*1,2*). In August 2004, the California Department of Health Services (CDHS) and Division of Occupational Safety and Health (Cal/OSHA) received the first report of a bronchiolitis obliterans diagnosis in a flavor-manufacturing worker in California. In April 2006, a second report was received of a case in a flavor-manufacturing worker from another company. Neither worker was employed in the microwave-popcorn industry; both were workers in the flavor-manufacturing industry, which produces artificial butter flavoring and other flavors such as cherry, almond, praline, jalapeno, and orange. Both workers had handled pure diacetyl, an ingredient in artificial butter and other flavorings, and additional chemicals involved in the manufacturing process. Studies have indicated that exposure to diacetyl causes severe respiratory epithelial injury in animals (*3–5*). Because the manufacture of flavorings involves more than 2,000 chemicals, workers in the general flavor-manufacturing industry are

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