

## CHAPTER 4. FATAL AND NONFATAL INJURIES: MSHA DATA

This chapter presents an overview of fatal and nonfatal injuries reported to MSHA during 1986-1995. Reportable injuries follow the criteria for reporting specified in 30 CFR 50. These criteria are listed in appendix A. The data used for these analyses came from the MSHA accident, injury, and illness data closeout files for the years 1986-1995. The MSHA data are described in appendix A and methods used in data analysis in appendix B. *There may be slight discrepancies between the figures presented here and other presentations of MSHA data for the following reasons: (1) injuries to nonemployees have been excluded from analysis; and (2) injuries identified by MSHA after the files were closed out are not included.*

Within the MSHA data, there are differences in reporting requirements for operators and contractors. Contractors are required to report only those injuries that occur during certain categories of work (described in appendix A). For this reason, *data on injuries among employees of operators and contractors in the MSHA database should not be considered directly comparable.*

As discussed in the “Introduction,” the MSHA data on fatal injuries differ from the CFOI data (chapter 1) because of varying definitions used for the mining industry. As compared to the CFOI data, MSHA data exclude injuries that occurred off of mine property and include injuries occurring at mills and processing plants on mine property.

Tables 4-1 through 4-9 and figure 4-1 provide comparisons of injury frequencies and rates among the commodities. These comparisons are followed by sections 4A through 4E, which provide more detailed tables and figures for each commodity separately. The method used to calculate injury rates is described in appendix B. *Since denominator data for occupations (job titles) were available for 1986 only, estimates of rates by occupation for the entire 10-year period are based on extrapolation from 1986 data. For this reason, estimates of injury by occupation should be interpreted with caution.*

### Fatal Injuries

A total of 1,078 fatal on-the-job injuries were reported to MSHA during the 10-year period 1986-1995. The average annual fatal injury rate for all commodities combined during this period was 30.9 per 100,000 full-time equivalent workers. Mine operators accounted for 908 (84%) of the fatalities and had an average annual fatal injury rate of 28.2 per 100,000. While mine contractors comprised only 16% (n = 170) of the total number of fatalities, their average annual fatal injury rate was 2.3 times higher than that of mine operators (65.0 per 100,000).

Table 4-1 presents the number and rates of fatal injuries by commodity for operators and contractors. Contractors in metal, nonmetal, stone, and sand and gravel are grouped together, since MSHA data on employment were not available for rate calculations for these commodities separately. The highest average annual fatality rate for the period, 66.5 per 100,000, occurred among metal and nonmetallic mineral mining contractors, followed closely by coal contractors (63.1 per 100,000). Among mine operators, the highest average annual fatal injury rate was in coal (38.9 per 100,000); the lowest was in nonmetal (14.3 per 100,000).

Table 4-2 shows the average annual fatal injury rate by type of operation for each commodity for mine operators only. Of commodities with underground mines, all except stone had higher fatality rates at underground than at surface operations of these mines. The highest fatality rate for any operation occurred in surface operations at underground stone mines (124.5 fatal injuries per 100,000 workers). Stone had the second highest fatality rate for underground operations at underground mines (77.9 per 100,000). The highest rate for underground operations at underground mines occurred in metal (87.6 per 100,000).

Table 4-3 shows the number and rate of fatal injuries by U.S. Bureau of the Census occupational groups (described in appendix D) for the 10 occupation-commodity groups with the highest fatal injury rates. These data should be interpreted with caution because the denominator used in calculating the rates was based on an extrapolation from data for the year 1986 only, as described in appendix B. Extractive occupations are represented in this group for three commodities: coal, metal, and sand and gravel. Construction trades are included for coal, sand and gravel, and nonmetal.

The distribution of fatal injuries by commodity and work activity for mine operators is presented in table 4-4. A description of the work activity categories is in appendix C. Overall, the leading work activity at the time of injury was using or operating tools and machinery (26.4%) followed by constructing, repairing, and cleaning (24.0%), vehicular operations (18.8%), and materials handling (12.6%). The distribution varied by commodity. The largest percentage of fatal injuries occurred while operating tools and machinery in both coal and stone; during vehicular operations in metal; and during constructing, repairing, and cleaning activities in nonmetal and sand and gravel.

Table 4-5 shows the distribution of fatal injuries by commodity and MSHA accident classification for mine operators. A description of the MSHA accident classifications appears in appendix E. The largest proportion of injuries overall occurred during powered haulage (28.5%). The

leading MSHA classifications varied by commodity: fall of ground was responsible for the largest proportion of injuries in coal and nonmetal, while powered haulage was the leading MSHA classification for metal, stone, and sand and gravel.

### Nonfatal Injuries

Among the 267,232 nonfatal injuries reported to MSHA during 1986-1995, mine operators accounted for 95% (253,536) of the total. In contrast to the rates for fatal injuries, mine operators had higher nonfatal injury rates than contractors (7.9 per 100 full-time workers for operators compared to 5.2 per 100 for contractors). The largest number of injuries (131,144) and the highest injury rate (49.1 per 100) occurred among coal operators (table 4-6).

Table 4-7 shows the distribution and average annual rate of nonfatal injuries by commodity and subunit for mine operators. In coal, 75% of all nonfatal injuries occurred at underground mines; 69% of all nonfatal injuries occurred at underground locations of underground mines. The injury rates incurred at surface locations of underground mines were higher than those for underground locations in the commodities of nonmetal and stone; however, these results must be interpreted with caution due to the small percentage of total employment represented by surface locations of underground mines in these two commodities. Of surface mines, 83% of all injuries reported in sand and gravel occurred at strip mines; this compares to coal (16%), metal (26%), nonmetal (18%), and stone (40%). The highest injury rates reported at strip mines occurred in stone and sand and gravel (7.7 and 6.6 per 100 workers, respectively). An additional 17% of injuries in sand and gravel were reported in dredging operations. Preparation plants and mills accounted for a significant proportion of the injuries in the commodities of metal (41%), nonmetal (63%), and stone (56%). Preparation plants comprised about 8% of all nonfatal injuries in coal.

Figure 4-1 shows the nonfatal injury rates over the 10-year period by commodity sector for mine operators. All five commodity sectors show similar patterns when injury rates are examined by year, with the nonfatal injury rates increasing sharply from 1986 to 1988 (or 1989), then declining for the remainder of the period. This spike in injury rates seen during 1988 and 1989 was probably due to clarification of reporting requirements by MSHA, which resulted in improved reporting of injuries by mine operators.

Of all nonfatal injuries to mine operators, 61% resulted in time lost from work. By commodity sector, coal had the largest proportion of injuries that resulted in days lost from work (73%). Fifty-seven percent of all injuries in sand and gravel resulted in days lost, followed by stone (48%), nonmetal (42%), and metal (42%). The mean number of days lost in the

commodity of coal was 27 days, followed by metal (15 days), sand and gravel (13 days), nonmetal (12 days), and stone (12 days).

For sprains and strains, 76% of all injuries involved time lost from work compared to 51% of the injuries classified as nonsprains. Sprains and strains and lacerations were the two most common types of injury in all five commodity sectors. Contusions and fractures were the third and fourth most frequent, although the rank order varied among the commodity sectors. Table 4-8 shows the percentage of injuries and mean days lost by type of injury and commodity for the four most common types of injuries.

Table 4-9 shows the percentage of injuries and mean days lost by work activity and commodity for the four most common types of work activity. Overall, handling materials (30%) was the most common activity being performed at the time of injury, followed by using or operating tools or machinery (26%), constructing, repairing, and cleaning tasks (18%), and vehicular and transportation operations (13%).

Figures 4-2 and 4-3 show the body parts most commonly injured for injuries classified as strains and nonstrains among employees of mine operators in all commodities. The back was the body part most frequently affected by strain injuries (49%). For nonstrain injuries, the fingers were the most frequently affected body part, accounting for 23% of all injuries.

During the 10-year period, the distribution of workforce demographics (e.g., age and work experience) of injured workers varied by commodity sector. In coal, the average age and total mining experience of the injured workers steadily increased, while years of experience at current mine decreased. The number of years at current job remained relatively steady over the 10-year period. In the other four commodity sectors, the work experience indicators all remained relatively constant over the 10-year period. The average age of injured workers increased slightly, but less than the increase seen in coal.

Sections 4A through 4E are separate presentations of injury data for each commodity. Additional information not discussed here is provided in these sections, including a breakdown, within each MSHA classification, of the event and source resulting in injury. However, event and source are not provided for injuries due to fall of ground, since both event and source were falling rock for over 90% of these injuries.

**Table 4-1.—Mine operators and contractors: number and average annual rate of fatal injuries (per 100,000 full-time workers) by commodity, 1986-1995.**

Employer type and commodity	Number	(%)	Rate
<b>Operators</b>			
Coal	511	(47.4)	38.9
Metal	106	(9.8)	22.0
Nonmetal	45	(4.2)	14.3
Stone	157	(14.6)	20.3
Sand and gravel	89	(8.3)	26.2
<b>Contractors</b>			
Coal	74	(6.9)	63.1
Metal, nonmetal, stone, and sand and gravel	96	(8.9)	66.5
<b>Total</b>	<b>1,078</b>	<b>(100.0)</b>	<b>30.9</b>

Source: Mine Safety and Health Administration data.

**Table 4-2.—Mine operators: number and average annual rate of fatal injuries (per 1000,000 full-time workers) by commodity and subunit, 1986-1995.**

Subunit	Coal		Metal		Nonmetal		Stone		Sand and gravel	
	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
<b>Underground mines</b>										
Underground	337	55.7	56	87.6	16	45.4	12	77.9	NA	NA
Surface	31	50.0	5	29.7	0	*	5	124.5	NA	NA
<b>Surface mines</b>										
Strip	99	23.4	31	20.2	17	28.0	99	34.6	67	27.3
Other surface	3	42.4	0	*	0	*	0	*	22	47.3
<b>Independent shops/yards</b>	2	*	1	*	0	*	0	*	NA	NA
<b>Mill/preparation plant</b>	39	27.5	13	7.0	12	7.1	41	11.4	NA	NA
<b>Office</b>	0	*	0	*	0	*	0	*	0	*
<b>Total</b>	<b>511</b>	<b>38.9</b>	<b>106</b>	<b>22.0</b>	<b>45</b>	<b>14.3</b>	<b>157</b>	<b>20.3</b>	<b>89</b>	<b>26.2</b>

\*Rate not calculated because there were fewer than 3 fatalities.

NA - Not applicable; subunit does not exist for this commodity; or injuries and employment hours were not reported separately for the subunit.

Source: Mine Safety and Health Administration data.

**Table 4-3.—Mine operators: number and average annual rate of fatal injuries (per 100,000 full-time workers) for the 10 occupation-commodity groups with the highest fatal injury rates.**

Occupational group and commodity	Number of fatalities	Average annual rate per 100,000
Construction trades, sand and gravel	3	307.7
Extractive occupations, coal	196	85.1
Extractive occupations, metal	44	75.5
Protective service, coal	4	69.8
Precision production, stone	7	59.9
Construction trades, coal	94	55.9
Extractive occupations, sand and gravel	5	51.3
Construction trades, nonmetal	3	50.5
Professional specialty, coal	9	47.8
Helpers and laborers, sand and gravel	12	45.1

Source: Mine Safety and Health Administration data.

**Table 4-4.—Mine operators: number and percent of fatal injuries by commodity and work activity, 1986-1995.**

Work activity	Coal		Metal		Nonmetal		Stone		Sand and gravel		All operators	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Using or operating tools or machinery	141	(27.6)	20	(18.9)	6	(13.3)	47	(29.9)	26	(29.2)	282	(26.4)
Constructing, repairing, cleaning	121	(23.7)	21	(19.8)	14	(31.1)	33	(21.0)	29	(32.6)	256	(24.0)
Vehicle/transportation operations	97	(19.0)	26	(24.5)	5	(11.1)	32	(20.4)	11	(12.4)	202	(18.8)
Materials handling	56	(11.0)	16	(15.1)	10	(22.2)	17	(10.8)	15	(16.9)	139	(12.6)
All other	96	(18.8)	23	(21.7)	10	(22.2)	28	(17.8)	8	(9.0)	199	(18.2)
Total	511	(100.0)	106	(100.0)	45	(100.0)	157	(100.0)	89	(100.0)	1,078	(100.0)

Source: Mine Safety and Health Administration data.

**Table 4-5.—Mine operators: number and percent of fatal injuries by MSHA accident classification and commodity, 1986-1995.**

MSHA accident classification	Coal		Metal		Nonmetal		Stone		Sand and gravel		All operators	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Powered haulage	118	(23.1)	33	(31.1)	11	(24.4)	61	(38.9)	36	(40.5)	259	(28.5)
Fall of ground	162	(31.7)	18	(17.0)	13	(28.9)	13	(8.3)	1	(1.0)	207	(22.8)
Machinery	85	(16.6)	10	(9.4)	7	(15.6)	25	(15.9)	17	(19.1)	144	(15.9)
Electrical	42	(8.2)	9	(8.4)	5	(11.1)	12	(7.6)	17	(19.1)	86	(9.5)
All other	104	(20.4)	36	(34.0)	9	(20.0)	46	(29.2)	18	(20.2)	212	(23.3)
Total	511	(100.0)	106	(100.0)	45	(100.0)	157	(100.0)	89	(100.0)	908	(100.0)

Source: Mine Safety and Health Administration data.

**Table 4-6.—Mine operators and contractors: number and average annual rate of nonfatal injuries (per 100 full-time workers) by commodity for mine operators and contractors, 1986-1995.**

Employer type and commodity	Number	(%)	Rate
<b>Operators</b>			
Coal	131,144	(49.1)	10.0
Metal	31,494	(11.8)	6.5
Nonmetal	17,133	(6.4)	5.4
Stone	54,359	(20.3)	7.0
Sand and gravel	19,406	(7.3)	5.7
<b>Contractors</b>			
Coal	5,472	(2.0)	4.7
Metal, nonmetal, stone, and sand and gravel	8,224	(3.1)	5.7
Total	267,232	(100.0)	7.7

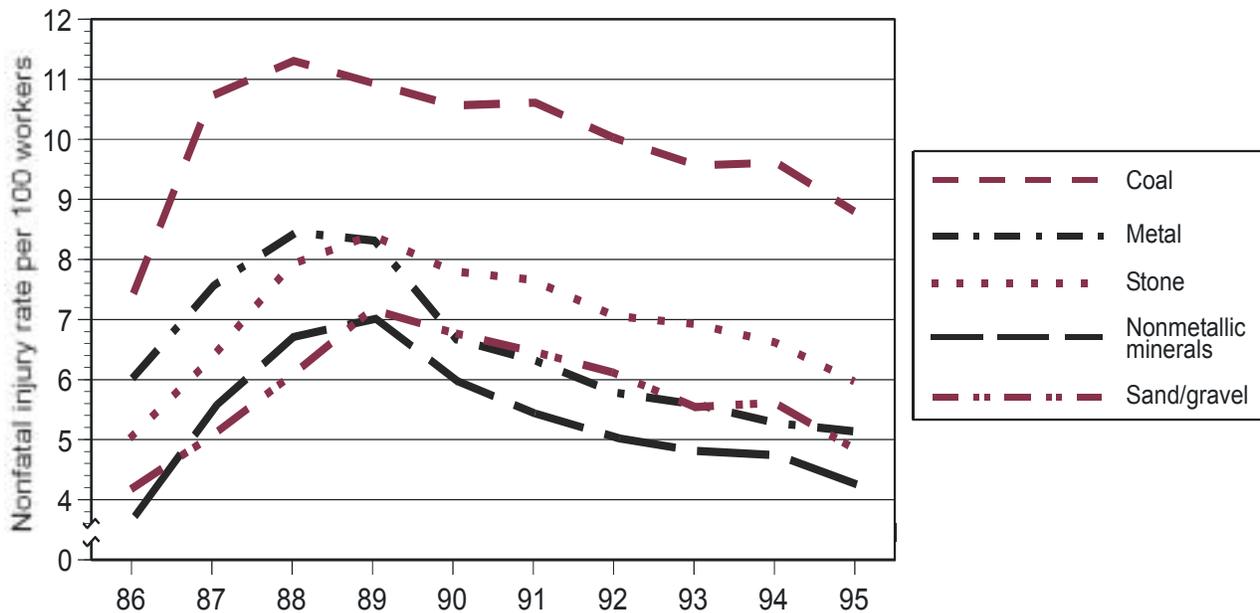
Source: Mine Safety and Health Administration data.

**Table 4-7.—Mine operators: number and average annual rate of nonfatal injuries (per 100 full-time workers) by commodity and subunit, 1986-1995.**

Subunit	Coal		Metal		Nonmetal		Stone		Sand and gravel	
	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
<b>Underground mines</b>										
Underground	91,011	15.0	8,177	12.8	2,575	7.3	1,173	7.6	NA	NA
Surface	6,784	10.9	1,293	7.7	566	8.8	450	11.2	NA	NA
<b>Surface mines</b>										
Strip	21,388	5.1	8,179	5.3	3,043	5.0	21,982	7.7	16,045	6.6
Other surface	571	8.1	488	8.3	69	8.0	93	6.1	3,252	7.0
<b>Independent shops/yards</b>	870	8.4	276	6.6	6	8.6	168	7.7	NA	NA
<b>Mill/preparation plant</b>	10,234	7.2	12,921	7.0	10,770	6.4	30,223	8.4	NA	NA
<b>Office</b>	286	0.4	160	0.3	104	0.2	270	0.3	109	0.2
<b>Total</b>	131,144	10.0	31,494	6.5	17,133	5.4	54,359	7.0	19,406	5.7

NA - Not applicable.

Source: Mine Safety and Health Administration data.



**Figure 4.1—Mine operators: rate of nonfatal injury (per 100 full-time workers) by commodity and year, 1986-1995. (Source: MSHA)**

**Table 4-8.—Mine operators: percent of injuries and mean days lost work for the 4 leading types of injury by commodity.**

Nature of injury	Coal (131,144 injuries)		Metal (31,494 injuries)		Nonmetal (17,133 injuries)		Stone (54,359 injuries)		Sand and gravel (19,406 injuries)	
	% of injuries	Mean days lost	% of injuries	Mean days lost	% of injuries	Mean days lost	% of injuries	Mean days lost	% of injuries	Mean days lost
<b>Sprains/strains</b>	40.4	35	34.2	22	36.1	17	32.7	16	29.7	16
<b>Lacerations</b>	16.4	5	23.4	2	19.9	2	19.4	3	21.2	3
<b>Contusions</b>	12.2	19	7.3	12	8.8	7	9.1	8	9.1	9
<b>Fractures</b>	10.3	37	11.4	23	7.9	23	9.3	24	9.2	25
<b>All other</b>	20.7	26	23.7	14	27.3	11	29.5	12	30.8	13
<b>Total</b>	100.0	27	100.0	15	100.0	12	100.0	12	100.0	13

Source: Mine Safety and Health Administration data.

**Table 4-9.—Mine operators: percent of injuries and mean days lost work for the 4 leading work activities by commodity.**

Work activity	Coal (131,144 injuries)		Metal (31,494 injuries)		Nonmetal (17,133 injuries)		Stone (54,359 injuries)		Sand and gravel (19,406 injuries)	
	% of injuries	Mean days lost	% of injuries	Mean days lost	% of injuries	Mean days lost	% of injuries	Mean days lost	% of injuries	Mean days lost
<b>Handling materials</b>	30.9	29	29.0	15	34.9	13	28.5	12	26.4	13
<b>Using or operating tools or machinery</b>	25.1	20	27.7	10	23.3	8	27.6	9	27.4	9
<b>Constructing, repairing, cleaning</b>	16.0	24	18.7	13	17.9	10	20.9	12	23.3	13
<b>Vehicle / transportation operations</b>	14.5	31	11.3	22	10.2	17	10.8	17	7.6	17
<b>All other</b>	13.5	31	13.3	20	13.7	16	12.2	16	15.3	17
<b>Total</b>	100.0	27	100.0	15	100.0	12	100.0	12	100.0	13

Source: Mine Safety and Health Administration data.

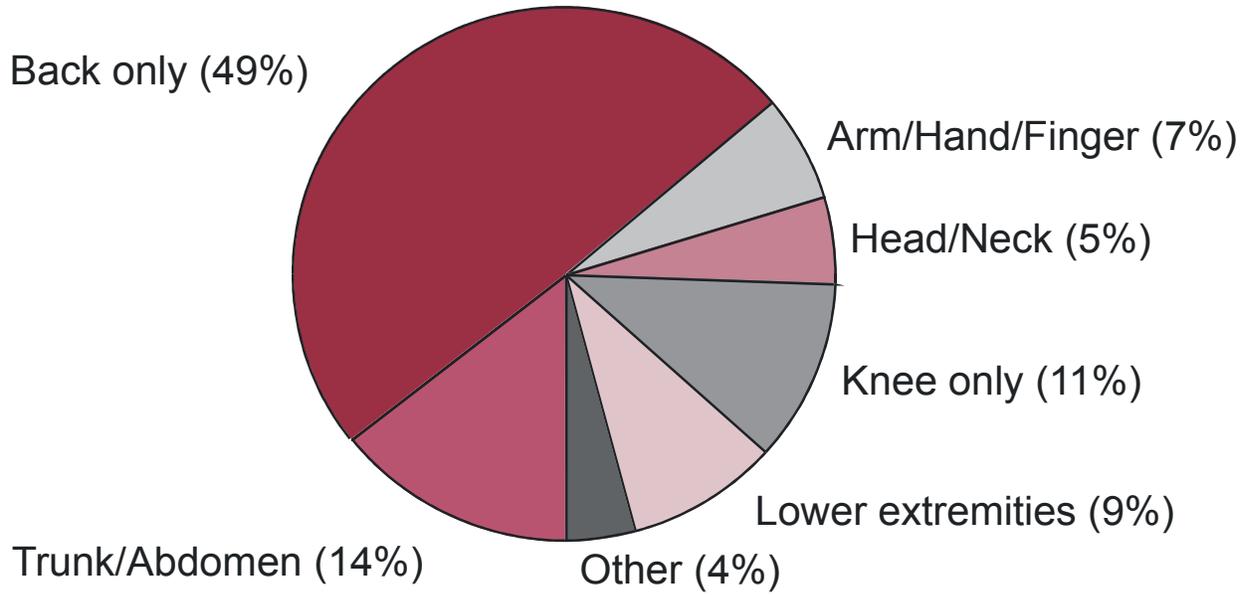


Figure 4-2.—Body part affected for strain injuries, all commodities combined, 1986-1995. (Source: MSHA)

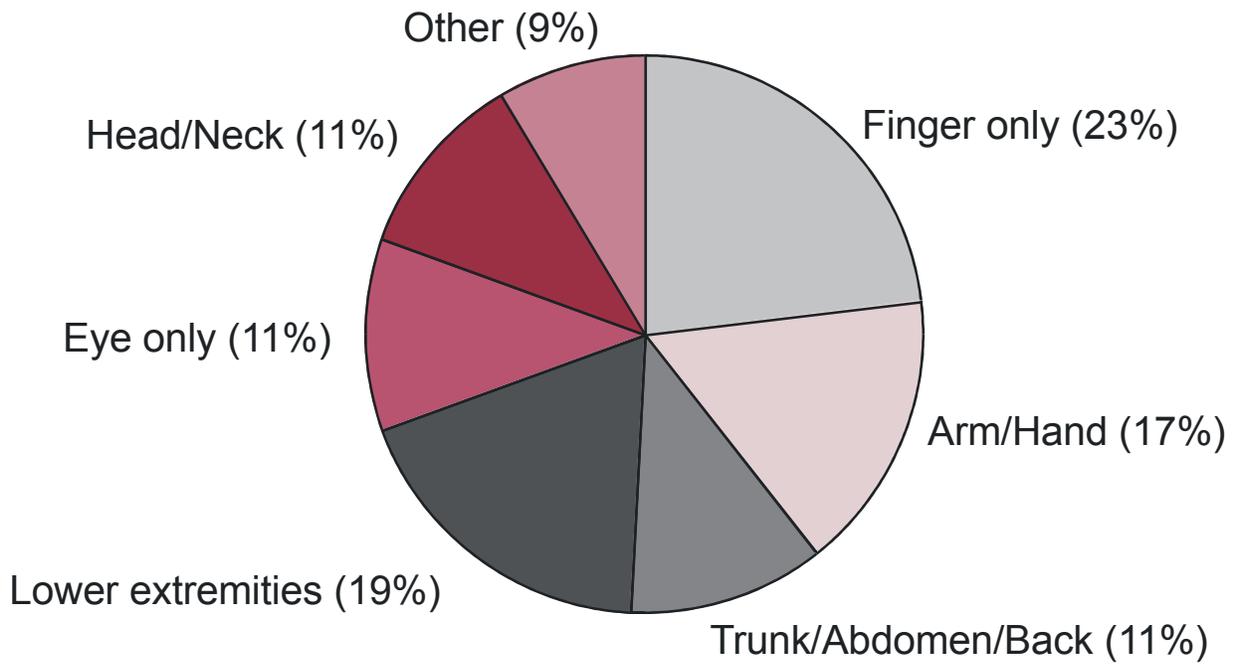


Figure 4-3.—Body part affected for nonstrain injuries, all commodities combined, 1986-1995. (Source: MSHA)

### 4A. INJURIES IN COAL MINING

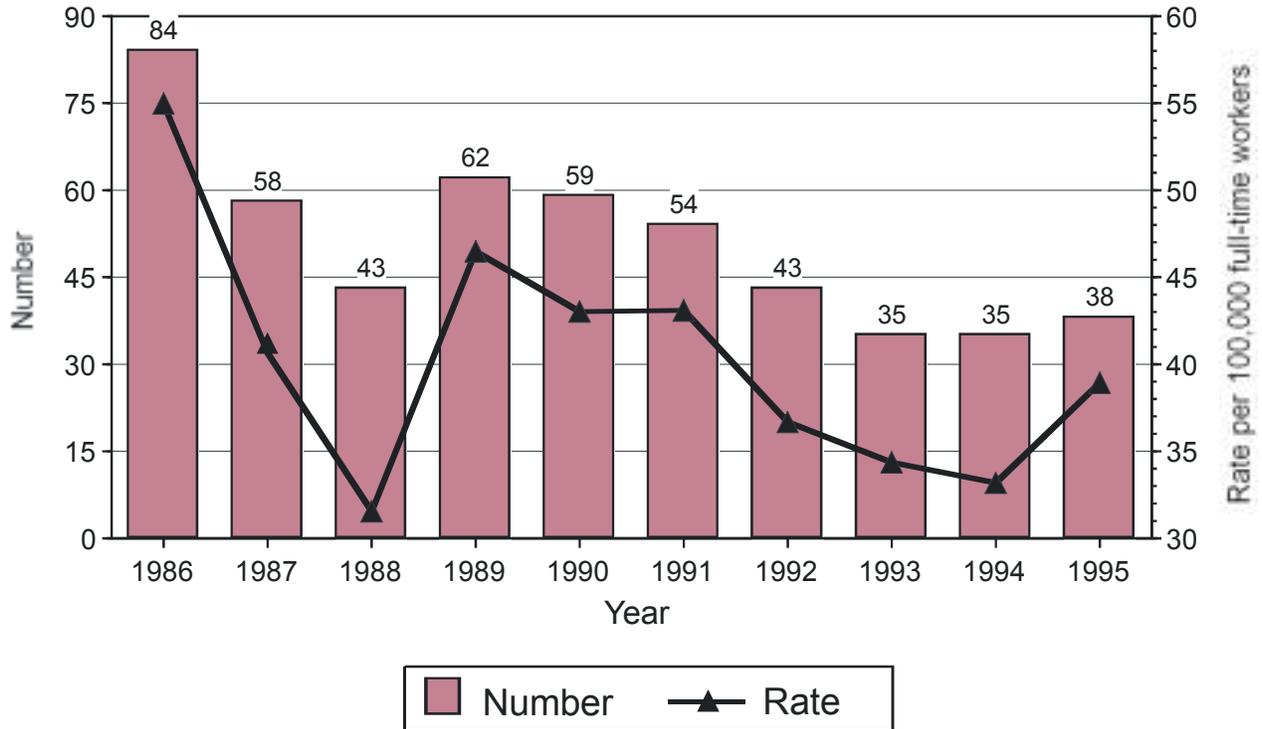


Figure 4A-1.—Coal operators: number and rate (per 100,000 workers) of fatal injuries by year, 1986-1995. (Source: MSHA data)

Table 4A-1.—Coal operators: number and average annual rate (per 100,000) workers of fatal injuries by subunit, 1986-1995.

<b>Mining operation</b>	<b>Number, 1986-1995</b>	<b>Average annual rate per 100,000 full-time workers</b>
<b>Underground mines:</b>		
Underground operations	337	55.68
Surface operations	31	49.96
<b>Surface mines:</b>		
Strip	99	23.39
Auger	1	*
Culm Bank	2	*
Dredge	0	*
<b>Independent shops/yards</b>	2	*
<b>Preparation Plants</b>	39	27.5
<b>Office</b>	0	*
<b>Total</b>	<b>511</b>	<b>38.86</b>

\* Rate not calculated because there were fewer than 3 fatalities

Source: Mine Safety and Health Administration data.

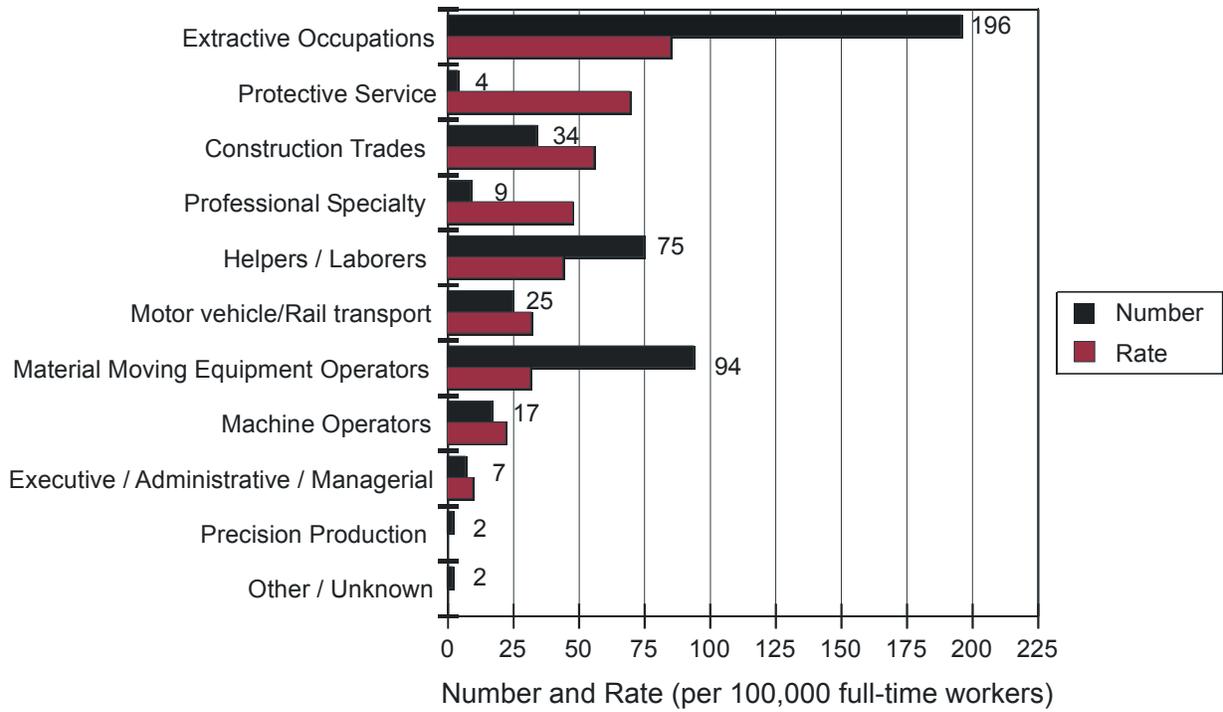


Figure 4A-2.—Coal operators: number and rate (per 100,000 workers) of fatal injuries by U.S. Bureau of the Census Occupation Division, 1986-1995. (Source: MSHA data)

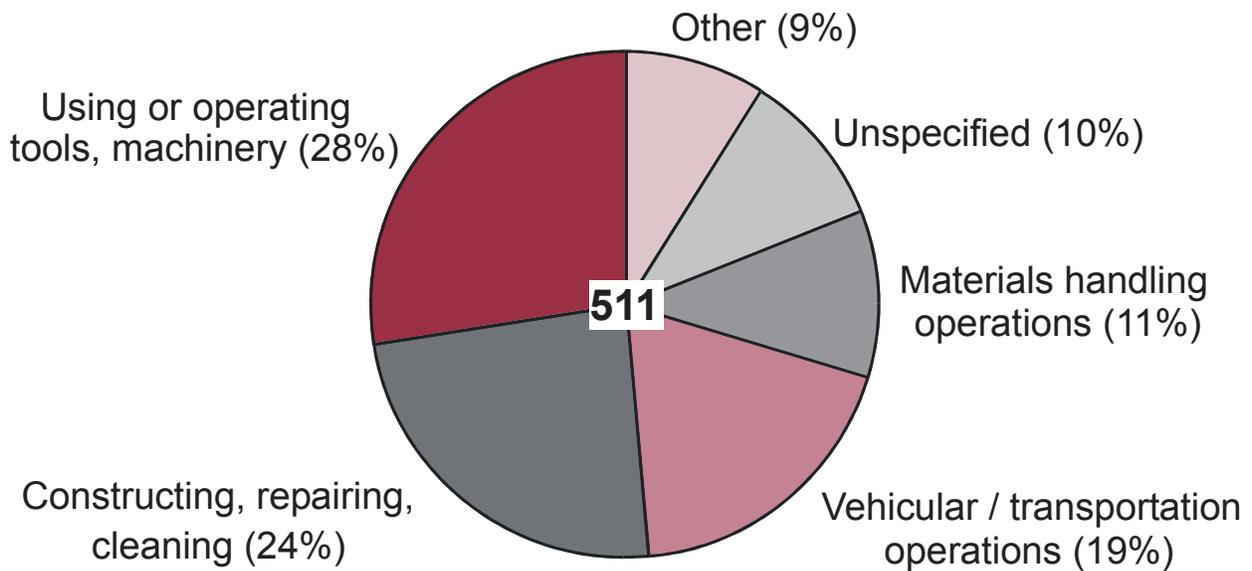


Figure 4A-3.—Coal operators: percent of fatal injuries by work activity, 1986-1995. (Source: MSHA data)

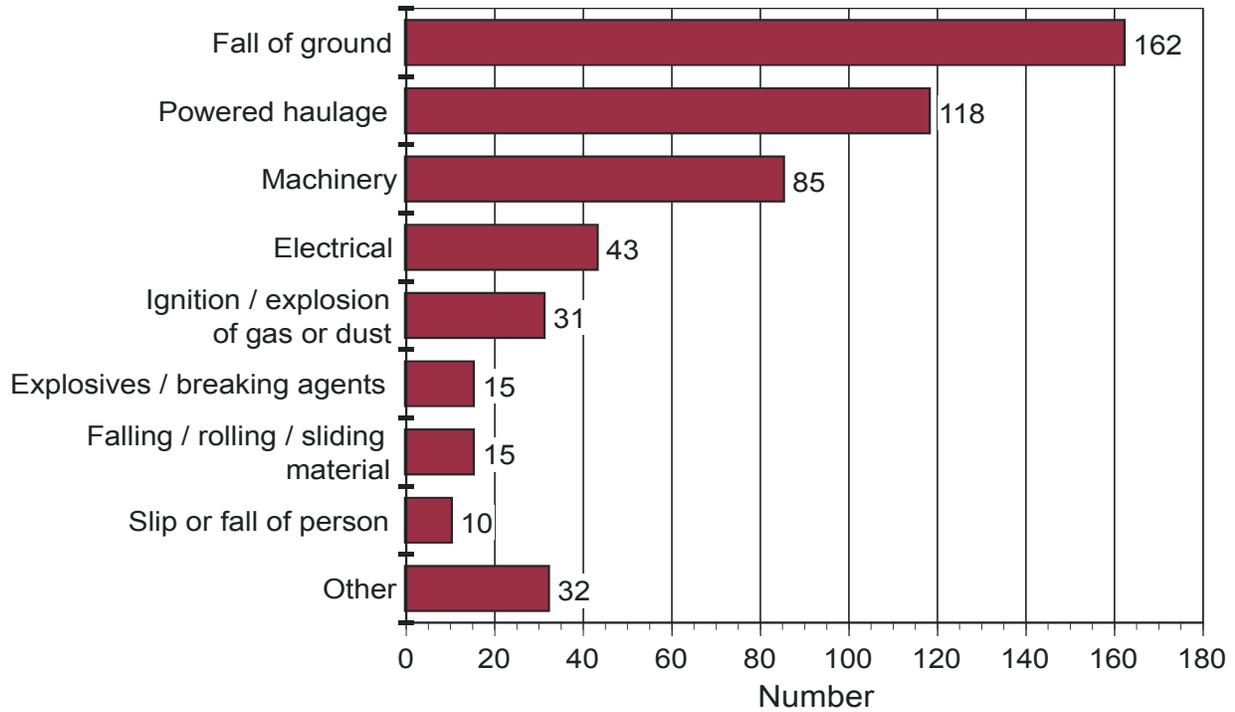


Figure 4A-4.—Coal operators: number of fatal injuries by MSHA accident classification, 1986-1995. (Source: MSHA data)

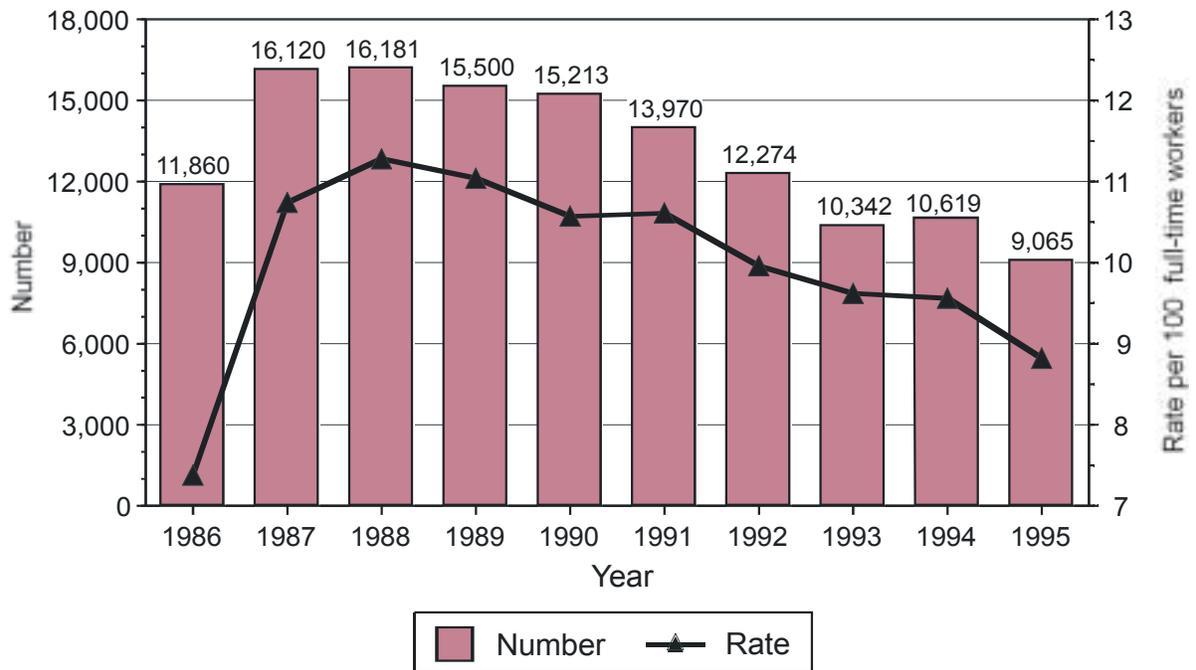
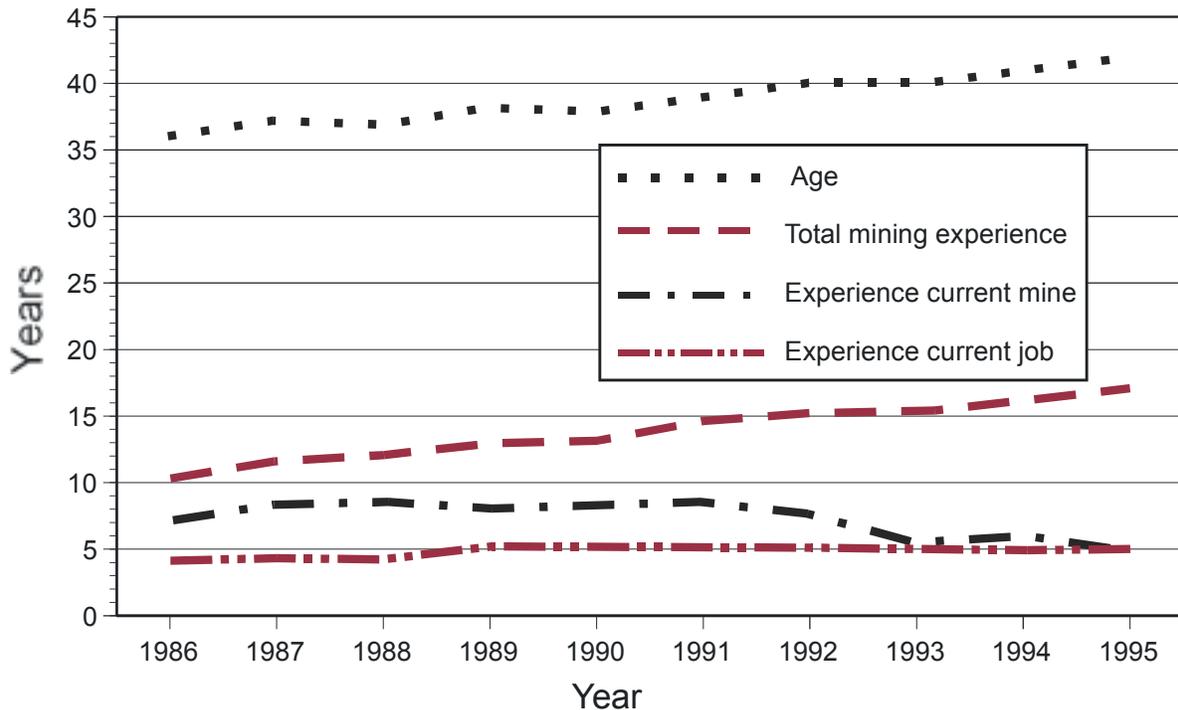


Figure 4A-5.—Coal operators: number and rate (per 100 workers) of nonfatal injuries by year, 1986-1995. (Source: MSHA data)

**Table 4A-2.—Coal operators: number and average annual rate (per 100 workers) of nonfatal injuries by subunit, 1986-1995.**

<u>Mining operation</u>	<u>Number, 1986-1995</u>	<u>Average annual rate per 100 full-time workers</u>
<b>Underground mines:</b>		
Underground operations	91,011	15.04
Surface operations	6,784	10.93
<b>Surface mines:</b>		
Strip	21,388	5.05
Auger	266	8.14
Culm Bank	286	8.7
Dredge	19	3.62
<b>Independent shops/yards</b>	870	8.4
<b>Preparation Plant</b>	10,234	7.22
<b>Office</b>	286	0.44
<b>Total</b>	<b>131,144</b>	<b>9.97</b>

Source: Mine Safety and Health Administration data.



**Figure 4A-6.—Coal operators: median values for age, total mining experience in current mine, and experience in current job for workers with nonfatal injuries by year, 1986-1995. (Source: MSHA data)**

**Table 4A-3.—Coal operators: nonfatal injuries, 1986-1995, by nature of injury. Number of cases, percentage of cases with one or more lost workdays, mean days lost work per case, total days work lost for all cases, and statutory days charged for all cases.**

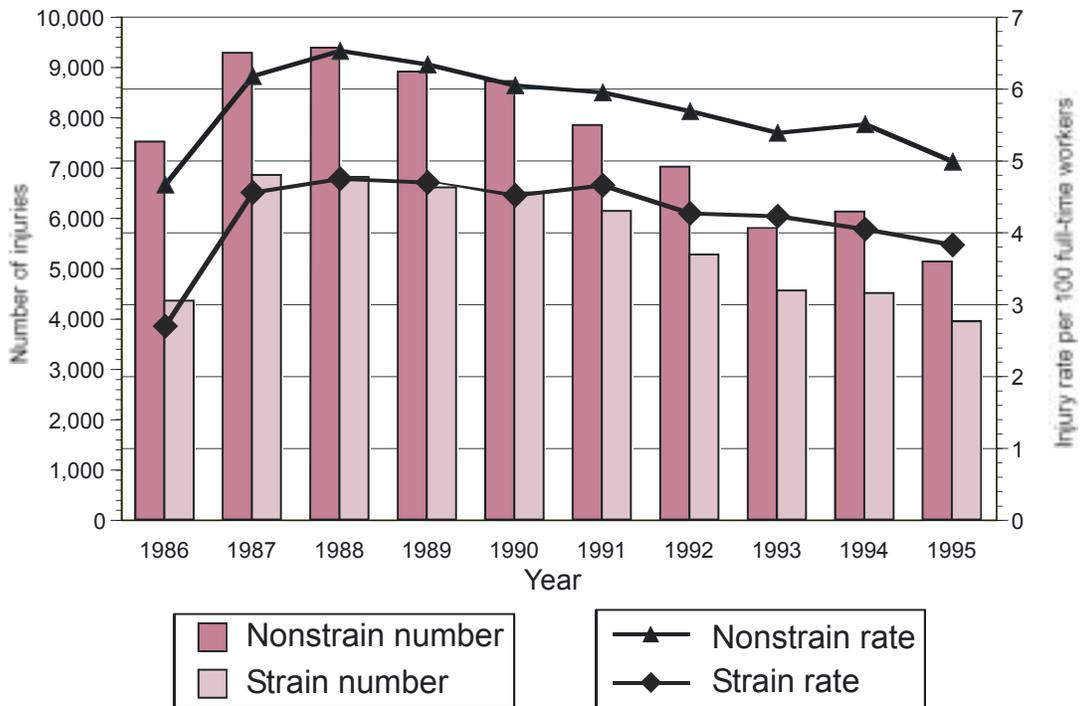
Nature of injury	Number of cases	Lost workday cases (%)	Mean days lost work	Total days lost	Total statutory days
Sprains and strains	52,939	87.0	35.31	1,869,202	59,874
Fracture	13,487	71.8	36.57	493,066	43,175
Contusions	16,010	81.3	18.90	302,523	10,970
Lacerations	21,543	33.6	5.36	115,546	4,245
Hernia	1,117	84.2	31.90	35,635	45,450
Crushing	1,499	71.8	20.32	30,421	5,550
Amputation or enucleation	665	75.3	44.14	29,352	325,173
Dislocation	600	80.0	39.80	23,879	350
Burn, heat	1,351	64.8	13.43	18,115	0
Electric shock	247	82.2	54.74	13,520	0
Joint, tendon, or muscle inflammation or irritation	485	78.6	26.94	13,065	0
Noncontact electric arc burn	983	73.6	10.02	9,854	0
Abrasions	1,139	61.7	6.74	7,675	0
Brain concussion	185	88.1	36.05	6,633	6,000
Electrical burn	195	76.4	19.50	3,802	50
Burn, chemical	701	56.5	4.71	3,305	0
Dust in eyes	1,559	41.2	1.59	2,479	0
Poisoning	244	50.4	2.74	669	0
Other specified causes	1,255	75.3	27.28	34,237	5,400
Multiple injuries, unspecified	9,093	75.5	29.77	270,626	69,480
Other unspecified injuries	5,847	81.6	36.70	214,558	9,000
<b>Total</b>	<b>131,144</b>	<b>73.2</b>	<b>26.28</b>	<b>3,498,162</b>	<b>584,717</b>

Source: Mine Safety and Health Administration data.

**Table 4A-4.—Coal operators: nonfatal injuries, 1986-1995, by work activity. Number of cases, percentage of cases with one or more lost workdays, mean days lost work per case, total days work lost for all cases, and statutory days charged for all cases.**

Work activity	Number of cases	Lost workday cases (%)	Mean days work lost	Total days lost	Total statutory days
Materials handling	40,469	77.3	29.25	1,183,702	163,034
Using or operating tools or machinery	32,899	64.0	20.49	673,893	134,133
Vehicular and transportation operations	19,000	80.4	30.58	580,959	95,945
Constructing, repairing, or cleaning	20,963	68.8	24.22	507,737	131,235
Bodily movement	12,373	78.4	30.00	371,211	22,065
Other	4,295	74.4	29.16	125,235	27,555
Unspecified	1,145	88.5	48.41	55,425	10,750
<b>Total</b>	<b>131,144</b>	<b>73.2</b>	<b>26.68</b>	<b>3,498,162</b>	<b>584,717</b>

Source: Mine Safety and Health Administration data.



**Figure 4A-7.—Coal operators: nonfatal injuries, 1986-1995. Number and rate (per 100 workers) of strain and nonstrain injuries by year. (Source: MSHA data)**

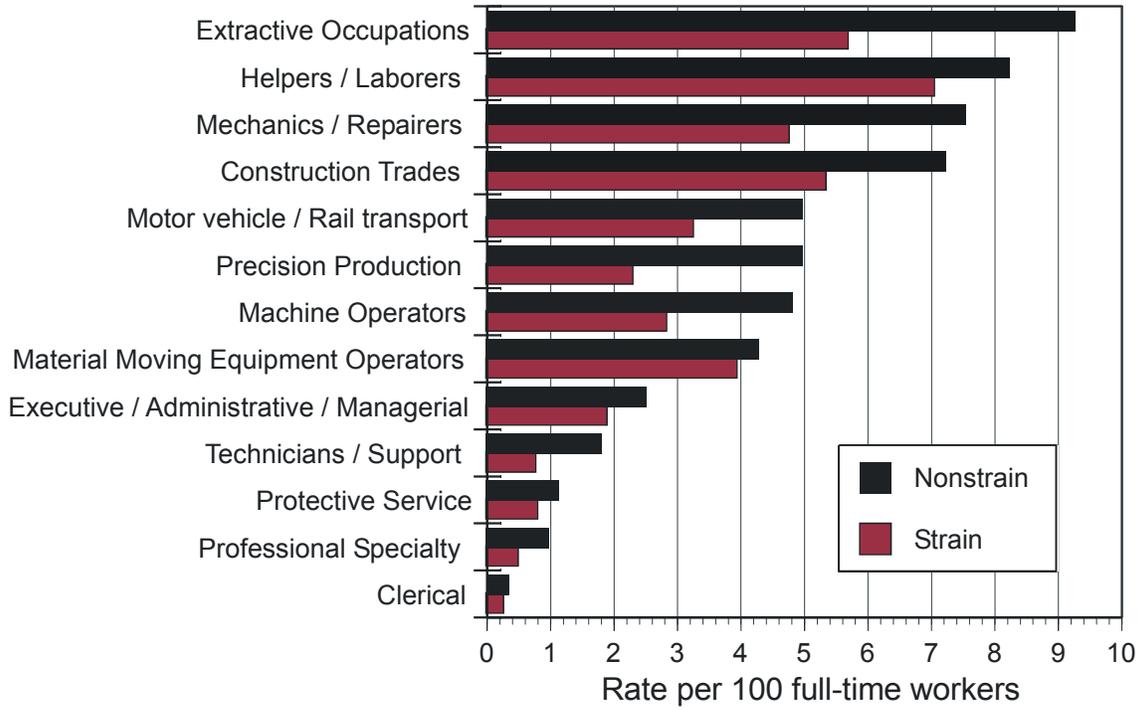


Figure 4A-8.—Coal operators: nonfatal injuries, 1986-1995. Rate (per 100 workers) of strain and nonstrain injuries by U.S. Bureau of the Census Occupation Division. (Data on occupations were missing for 3,726 out of 131,144 cases (1.8%).) (Source: MSHA data)

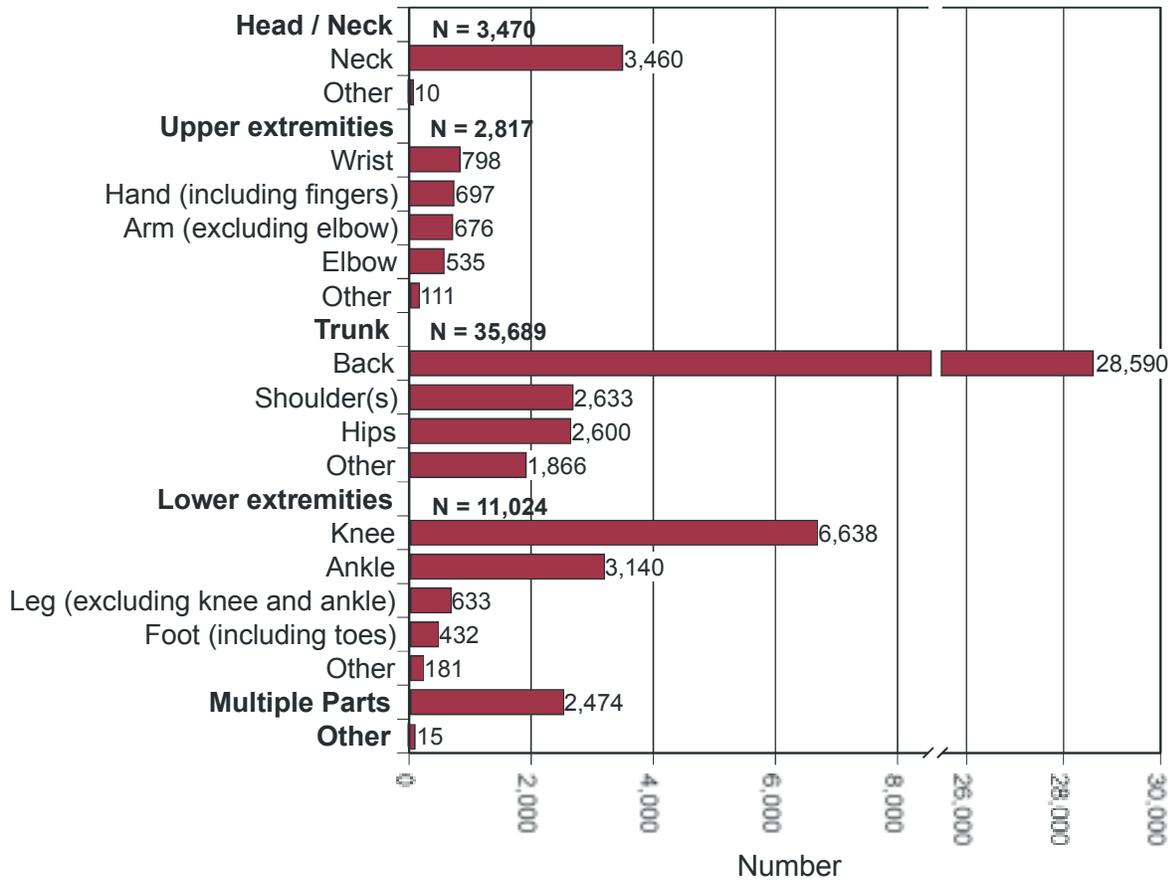


Figure 4A-9.—Coal operators: number of (nonfatal) strain injuries by body part injured, 1986-1995. (Source: MSHA data)

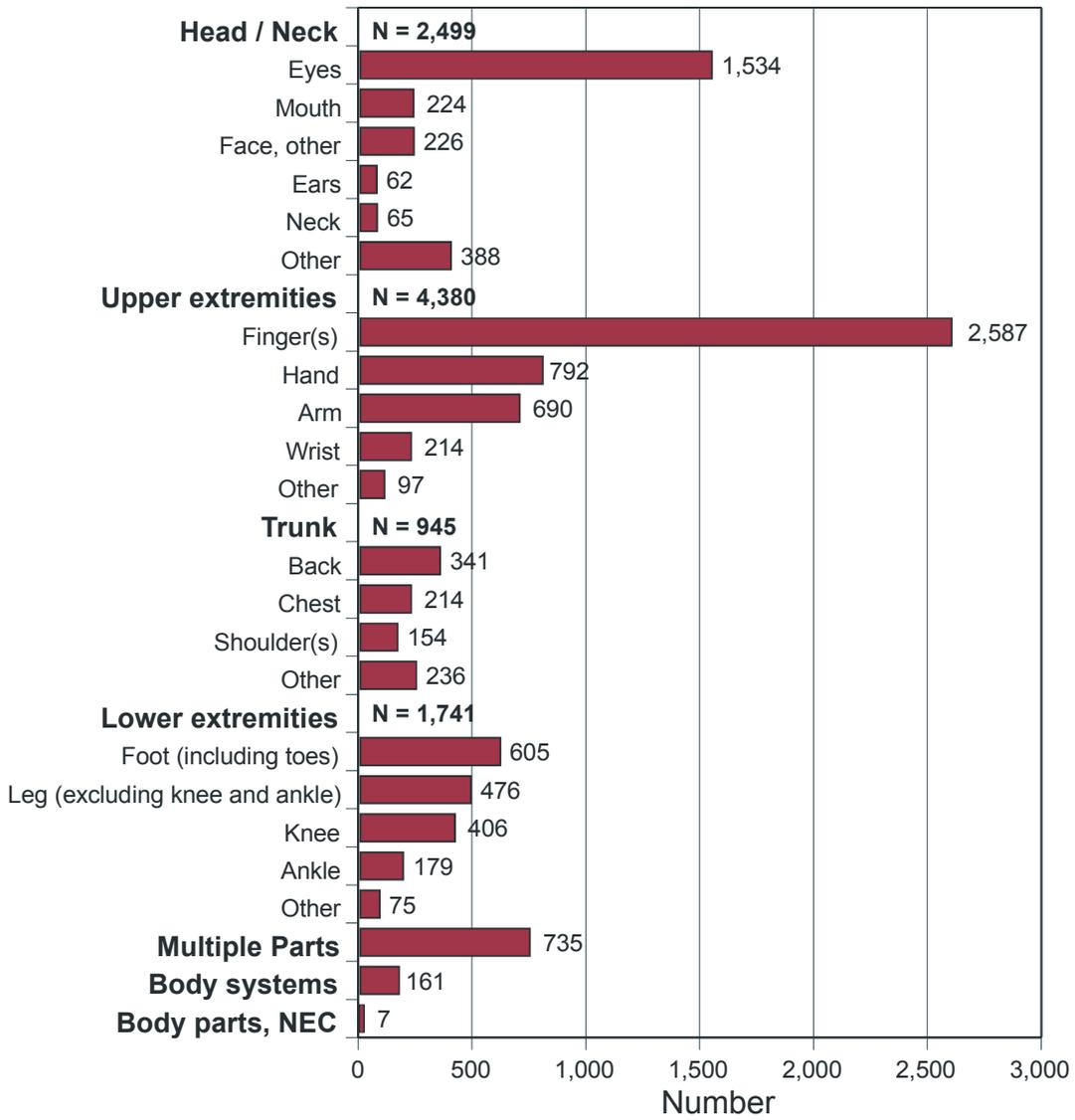
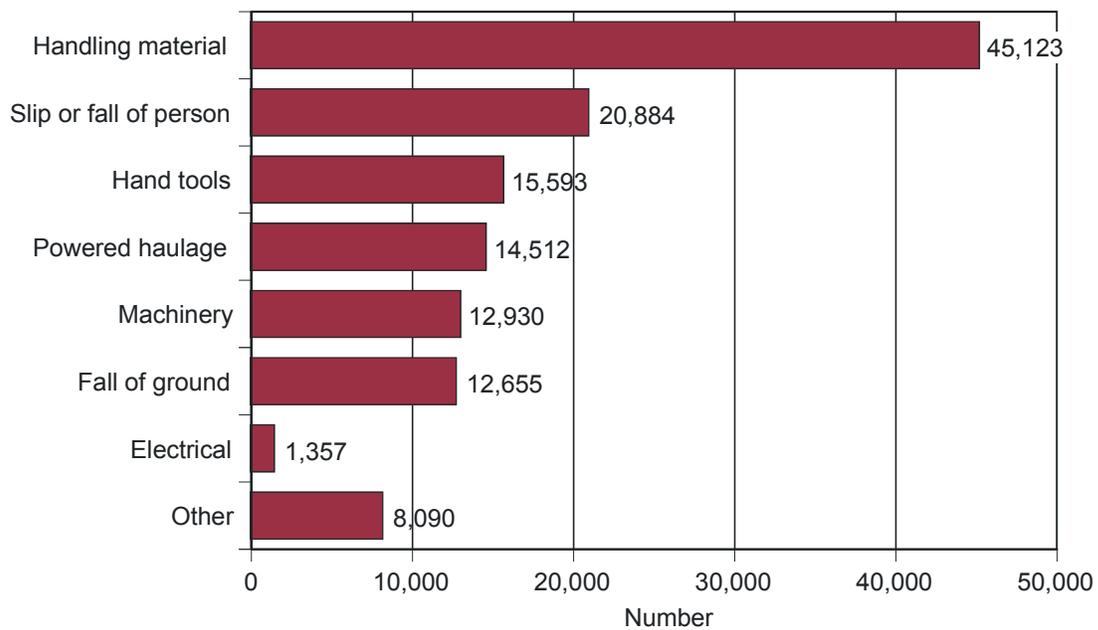


Figure 4A-10.—Coal operators: number of (nonfatal) nonstrain injuries by body part injured, 1986-1995. (Source: MSHA data)



**Figure 4A-11.—Coal operators: number of nonfatal injuries by MSHA accident classification, 1986-1995.**  
(Source: MSHA data)

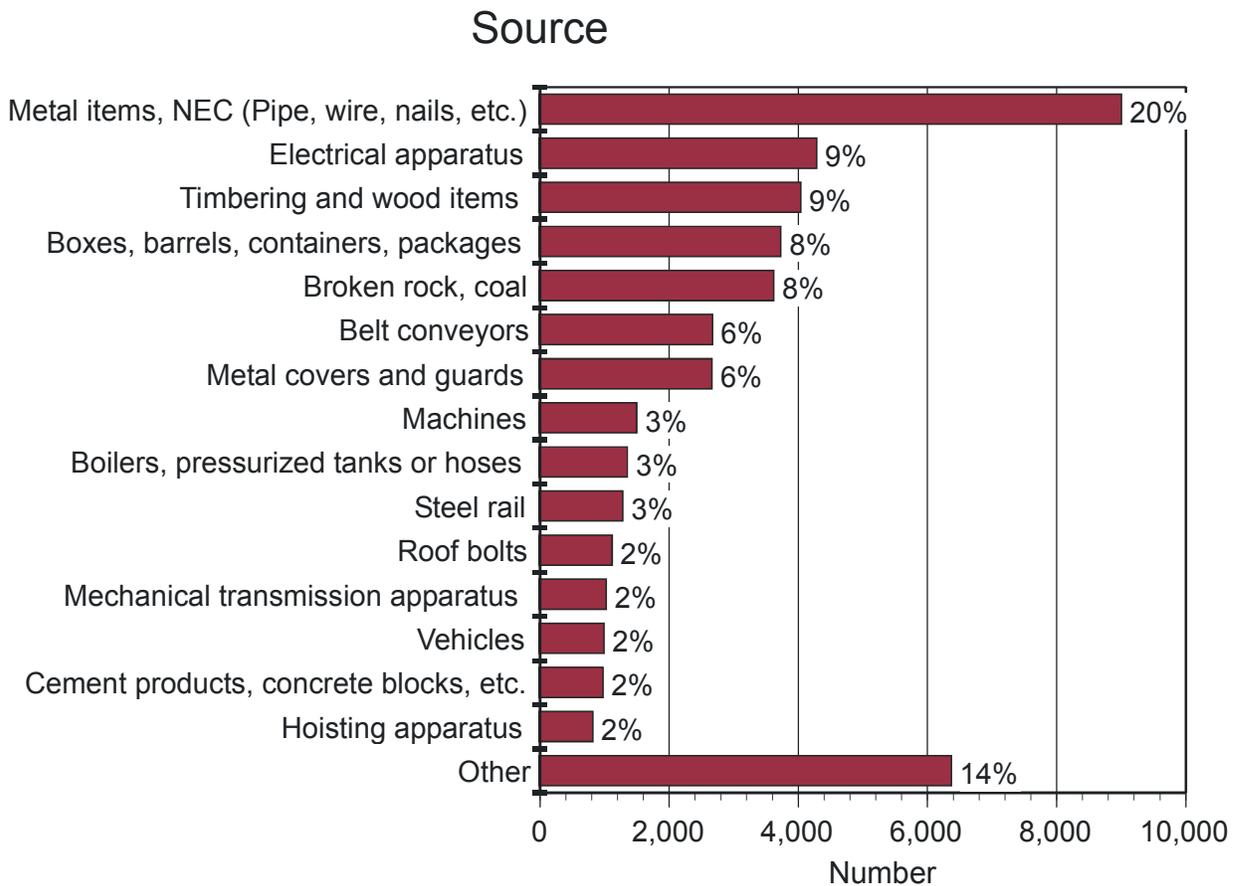
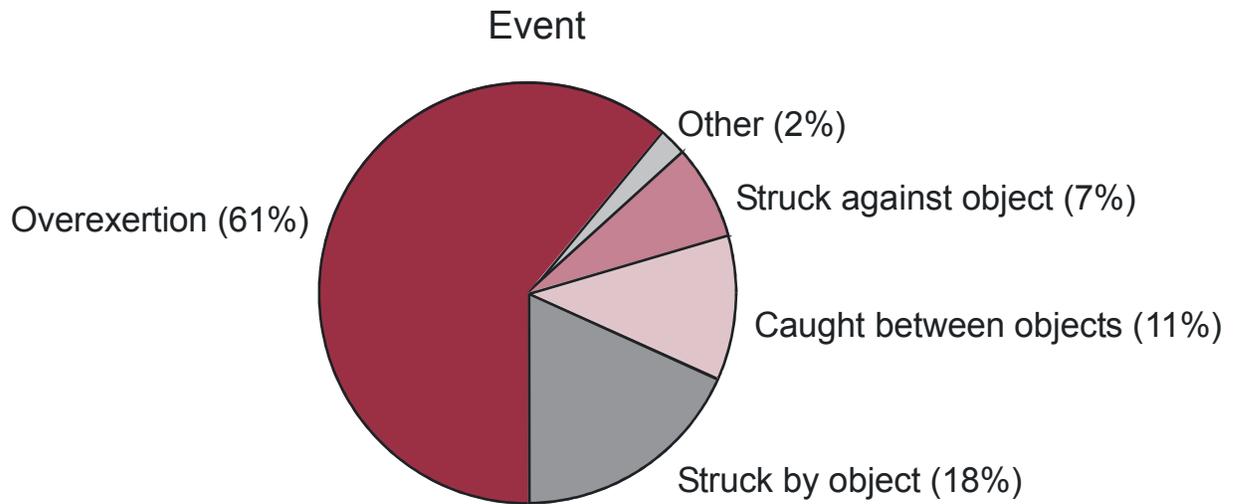
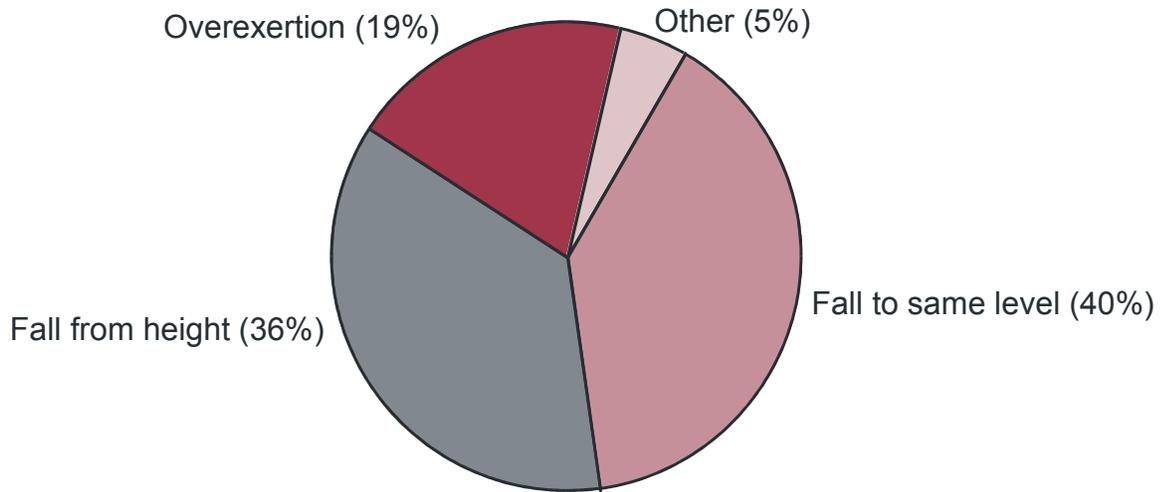


Figure 4A-12.—Coal operators: nonfatal material handling injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 45,123). (Source: MSHA data)

### Event



### Source

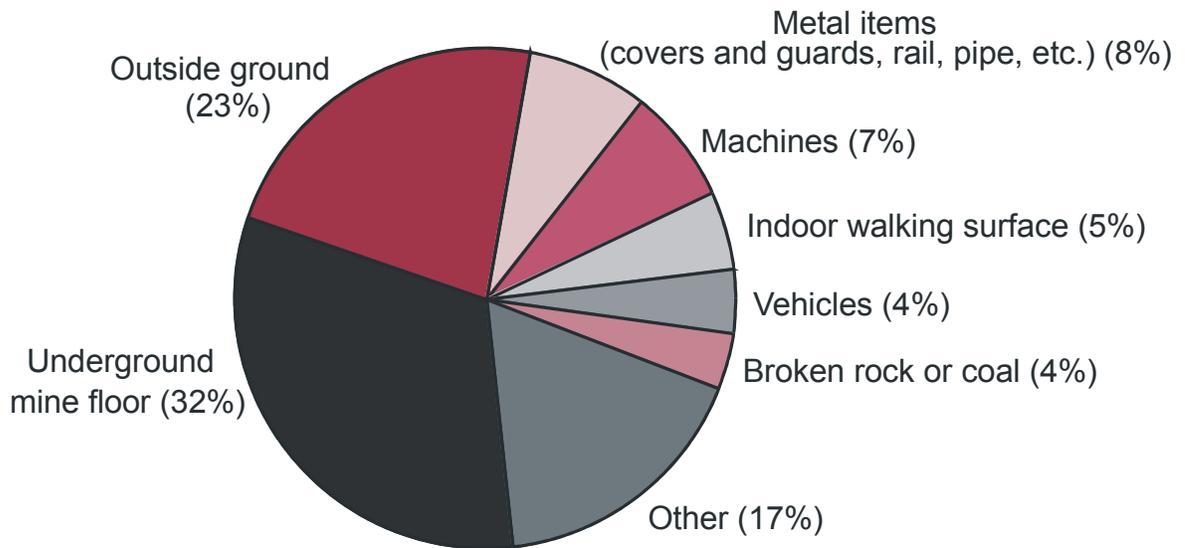


Figure 4A-13.—Coal operators: nonfatal fall injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 20,884). (Source: MSHA data)

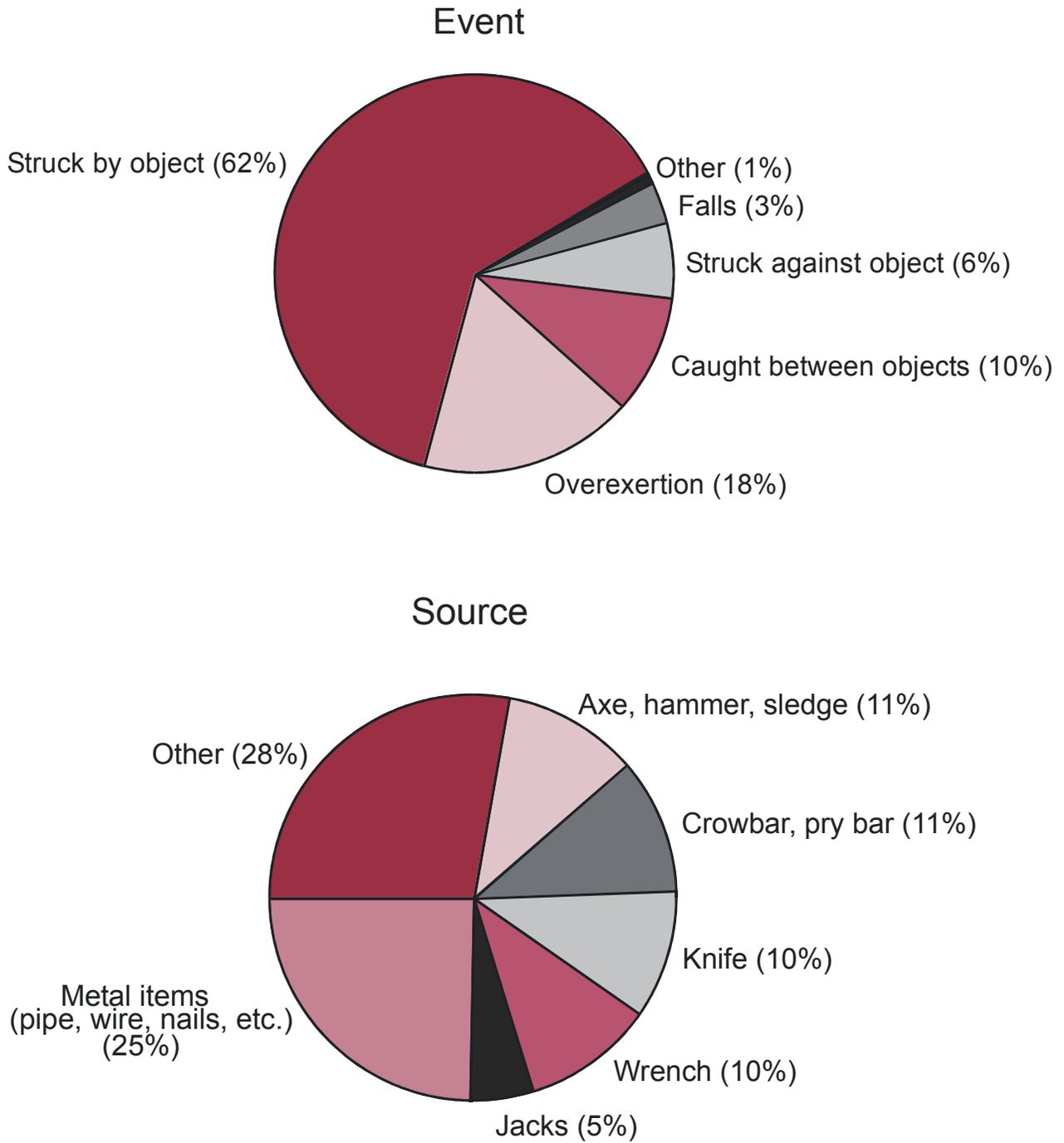
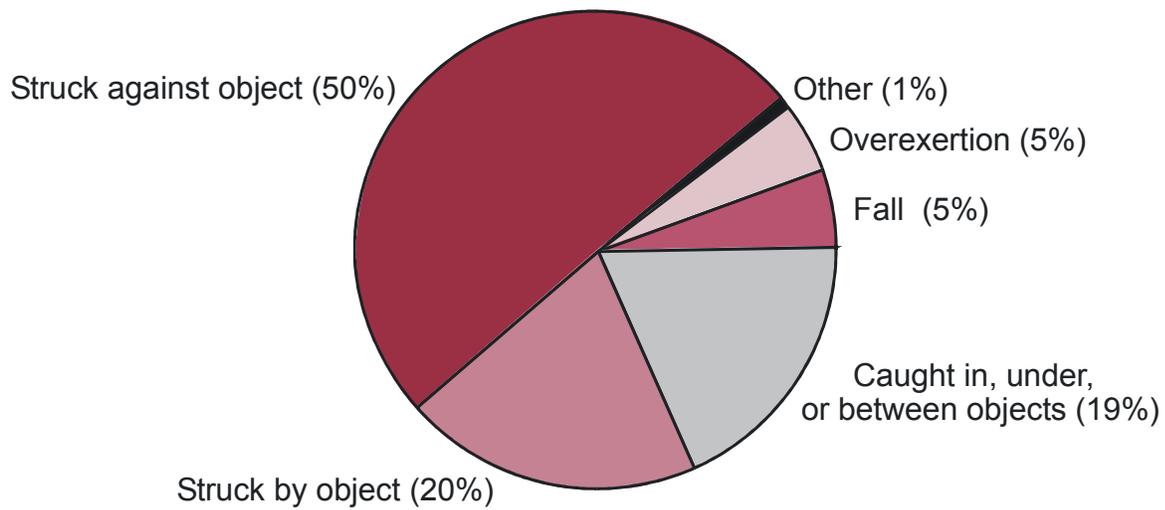


Figure 4A-14.—Coal operators: nonfatal hand tool injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 15,593). (Source: MSHA data)

### Event



### Source

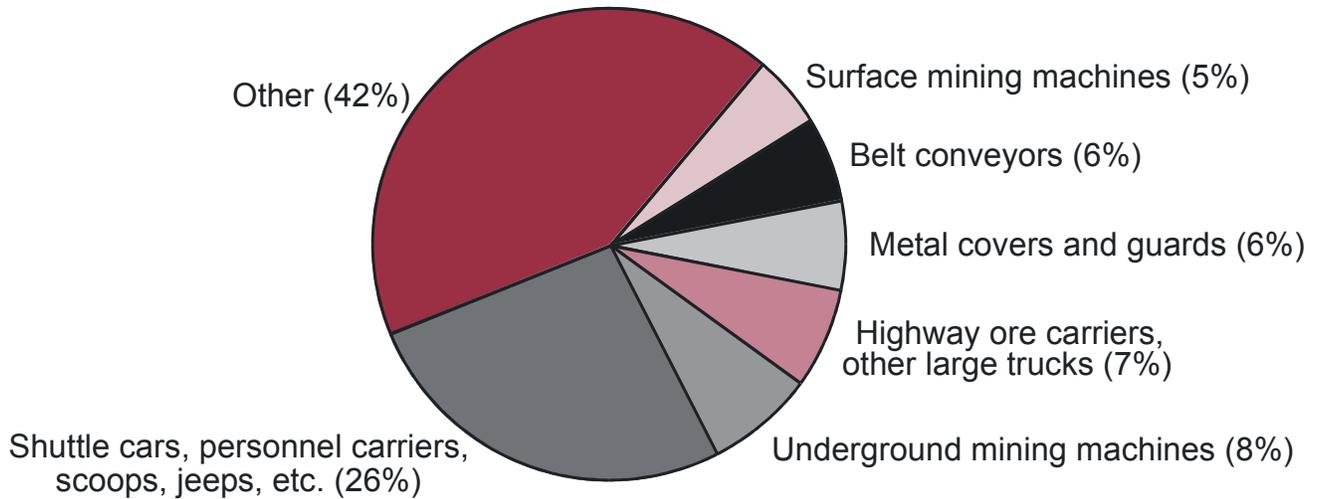
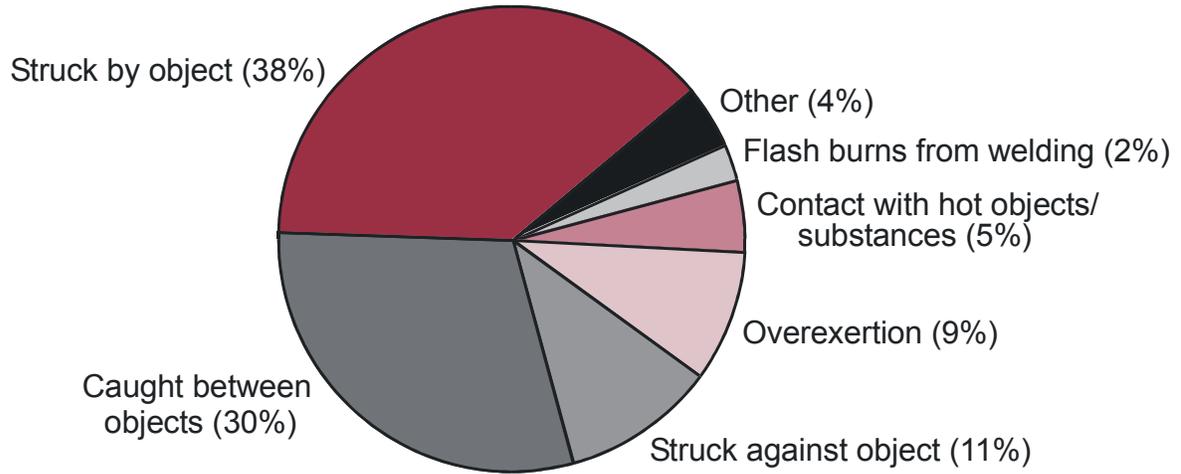


Figure 4A-15.—Coal operators: nonfatal powered haulage injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 14,512), (Source: MSHA data)

### Event



### Source

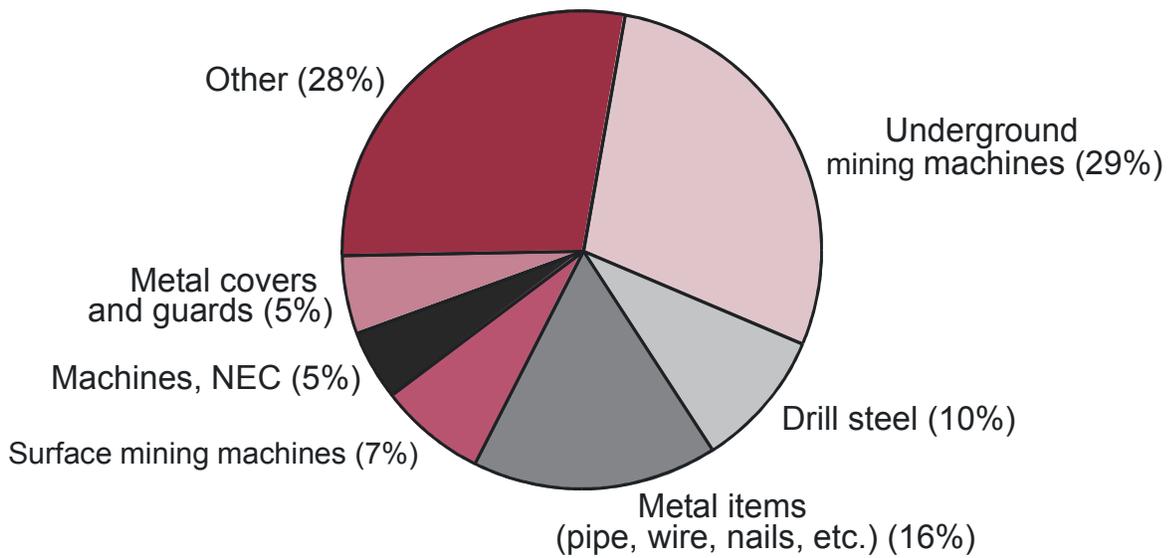


Figure 4A-16.—Coal operators: nonfatal machine injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 12,930). (Source: MSHA data)

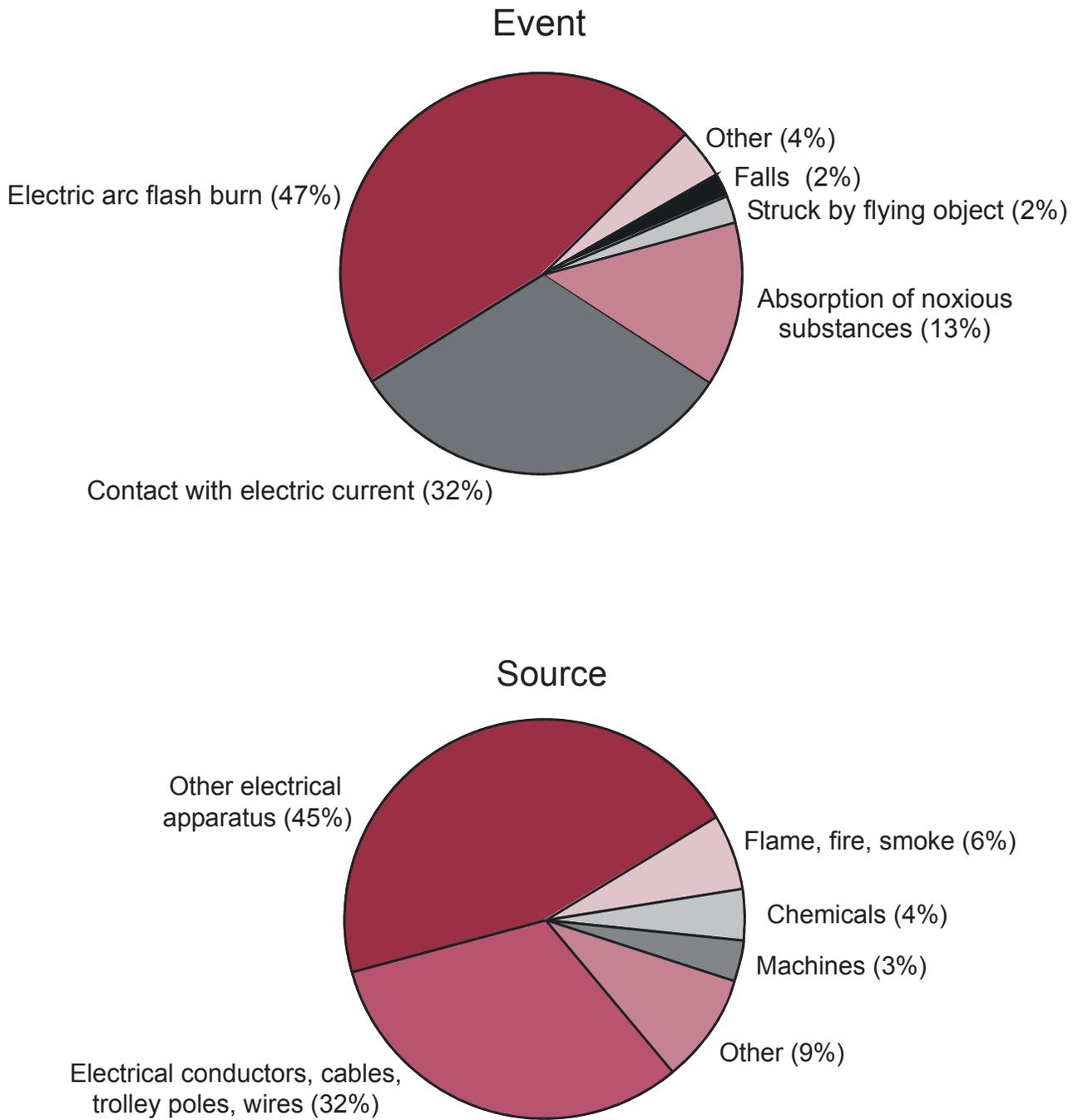


Figure 4A-17.—Coal operators: nonfatal electrical injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 1,357). (Source: MSHA data)

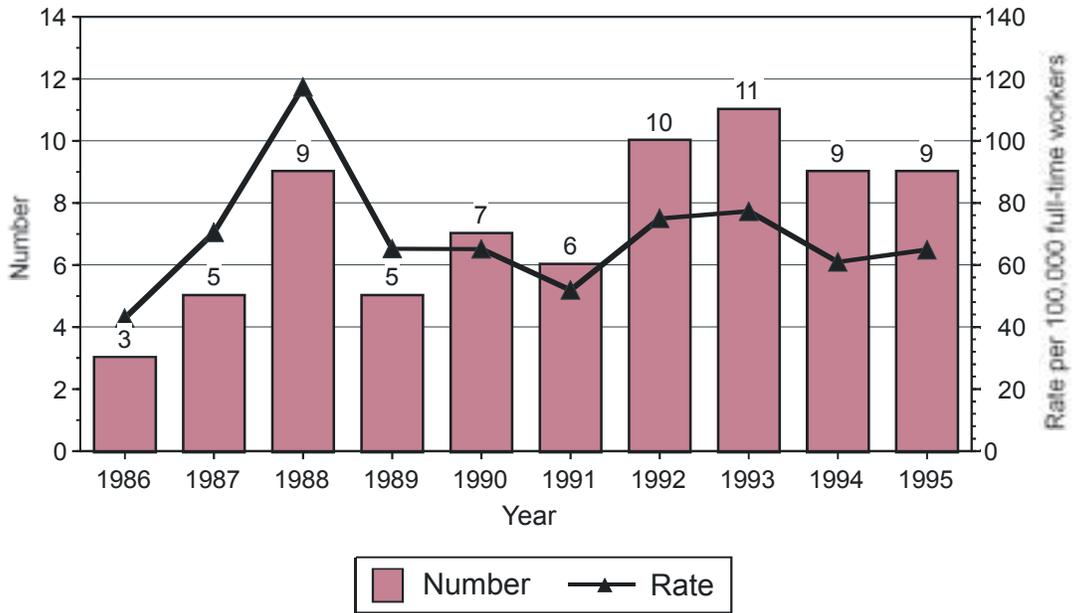


Figure 4A-18.—Coal contractors: number and rate of fatal injuries (per 1000,000 workers) by year. (Source: MSHA data)

Table 4A-5.—Coal contractors: number and average annual rate (per 100,00 workers) of fatal injuries by subunit, 1986-1995.

<u>Mining operation</u>	<u>Number, 1986-1995</u>	<u>Average annual rate per 100,000 full-time workers</u>
<b>Underground mines:</b>		
Underground operations	2	*
Surface operations	13	68.3
<b>Surface mines:</b>		
Strip	36	64.4
Auger	4	396.7
Culm Bank	1	*
Dredge	0	*
<b>Independent shops/yards</b>	1	*
<b>Preparation Plants</b>	17	75.87
<b>Office</b>	0	*
<b>Total</b>	<b>74</b>	<b>63.1</b>

\* Rate not calculated because there were fewer than 3 fatalities

Source: Mine Safety and Health Administration data.

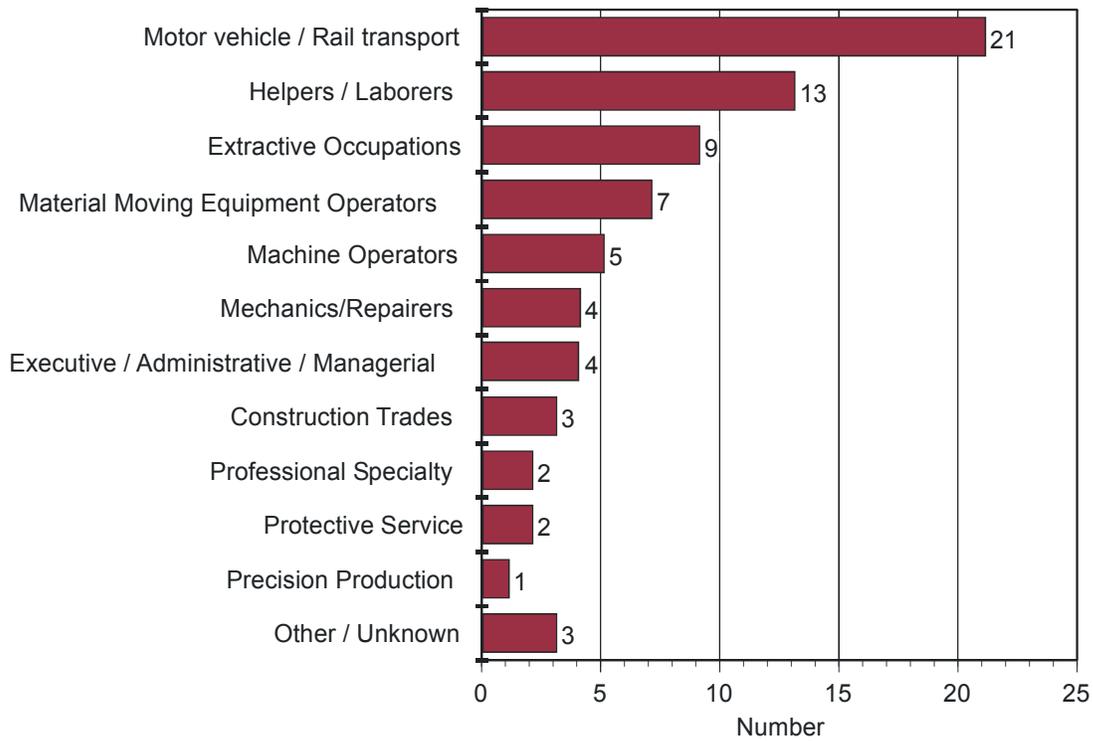


Figure 4A-19.—Coal contractors: number of fatal injuries by U.S. Bureau of the Census Occupation Division, 1986-1995. (Source: MSHA data)

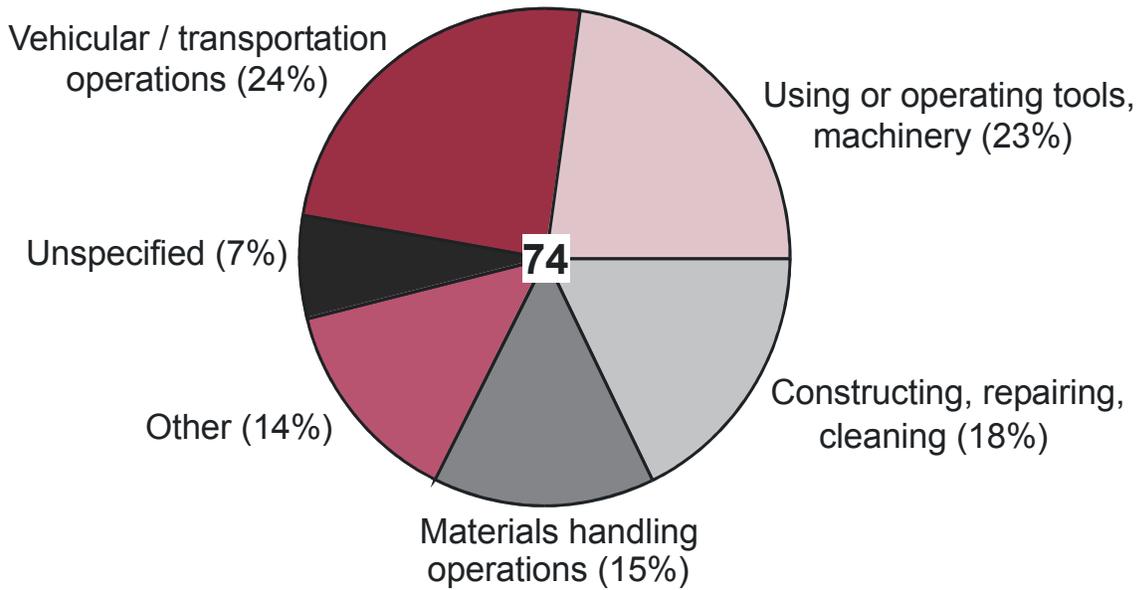


Figure 4A-20.—Coal contractors: percent of fatal injuries by work activity, 1986-1995. (Source: MSHA data)

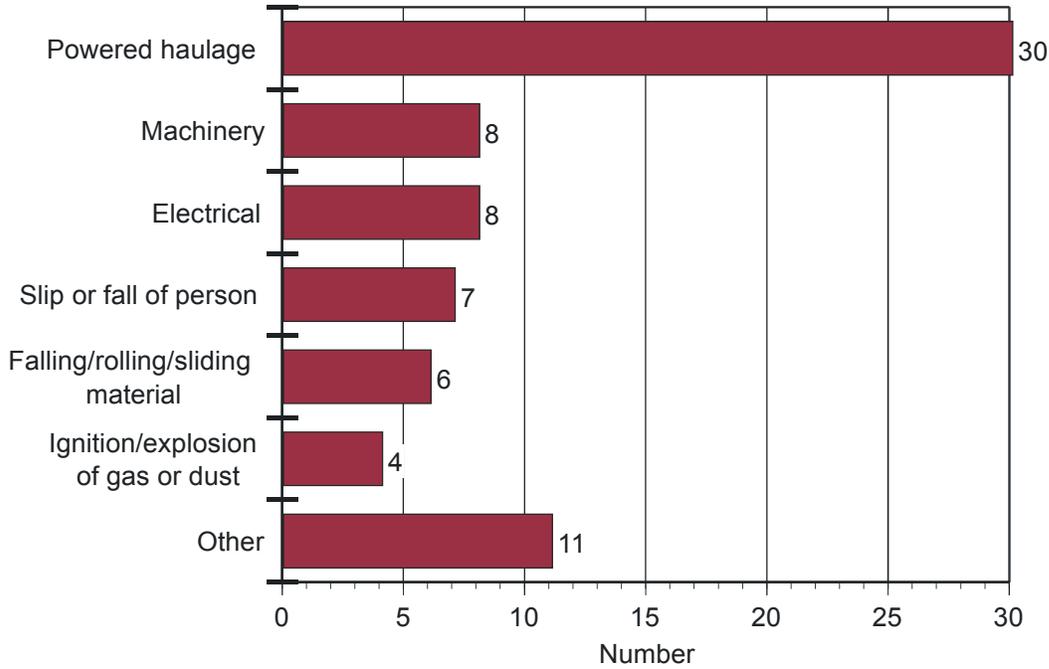


Figure 4A-21.—Coal contractors: number of fatal injuries by MSHA accident classification, 1986-1995. (Source: MSHA data)

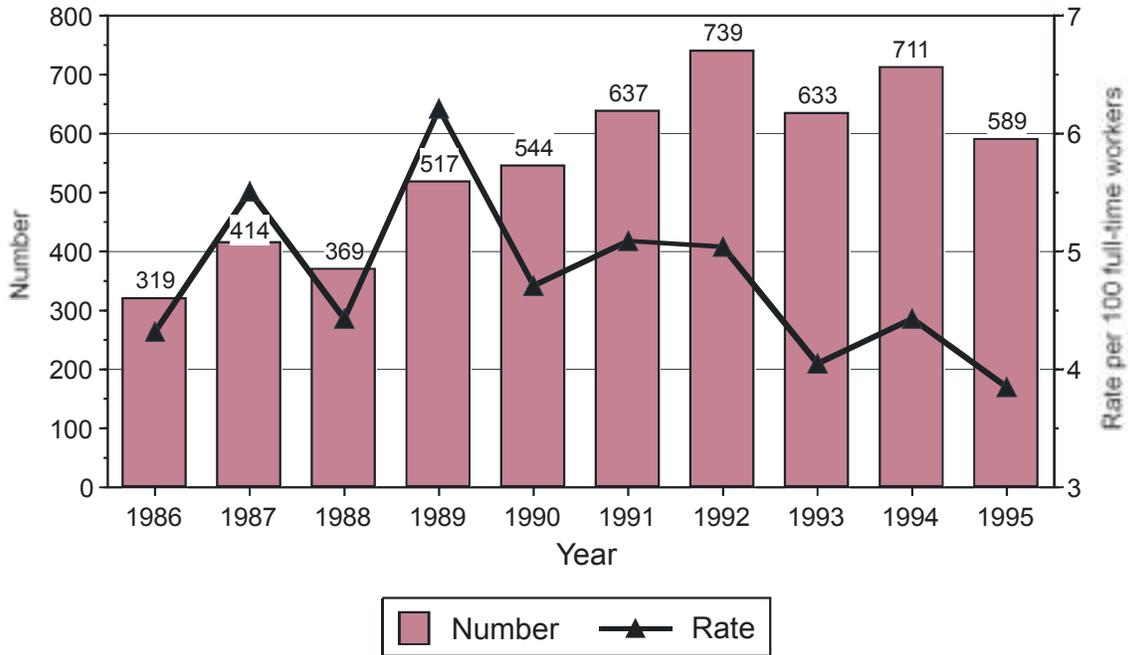
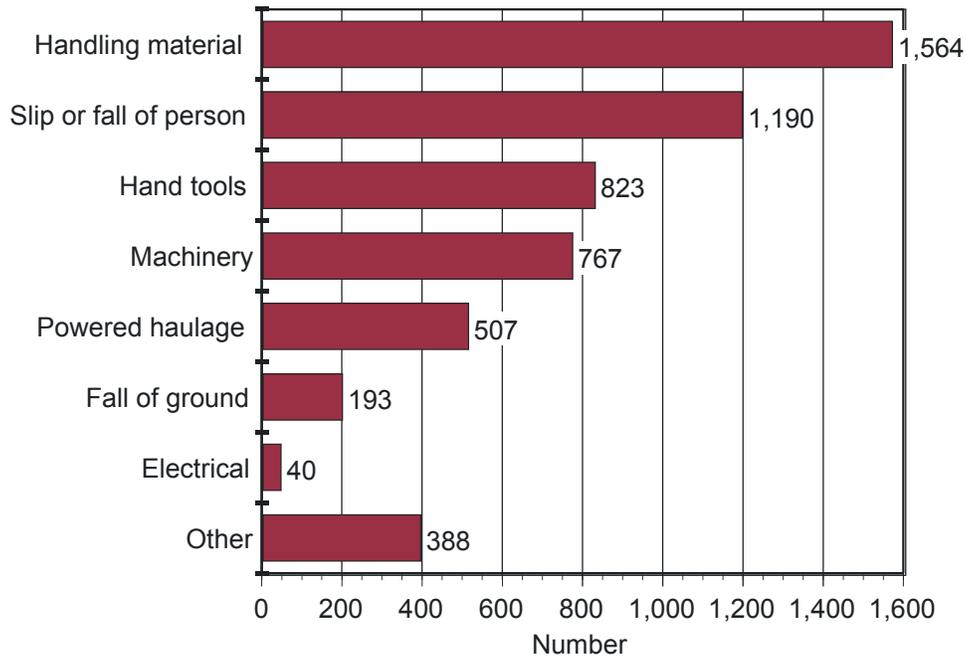


Figure 4A-22.—Coal contractors: number and rate (per 100 workers) of nonfatal injuries by year. (Source: MSHA data)

**Table 4A-6.—Coal contractors: number and average annual rate (per 100 workers) of nonfatal injuries by subunit, 1986-1995.**

<u>Mining operation</u>	<u>Number, 1986 -1995</u>	<u>Average annual rate per 100 full-time workers</u>
<b>Underground mines:</b>		
Underground operations	1,375	15.87
Surface operations	623	3.27
<b>Surface mines:</b>		
Strip	1,911	3.42
Auger	75	7.44
Culm Bank	10	1.69
Dredge	2	1.22
<b>Independent shops/yards</b>	26	17.55
<b>Preparation Plant</b>	1,379	6.15
<b>Office</b>	71	0.76
<b>Total</b>	5,472	4.67

Source: Mine Safety and Health Administration data.



**Figure 4A-23.—Coal contractors: number of nonfatal injuries by MSHA accident classification, 1986-1995. (Source: MSHA data)**

#### 4B. INJURIES IN METAL MINING

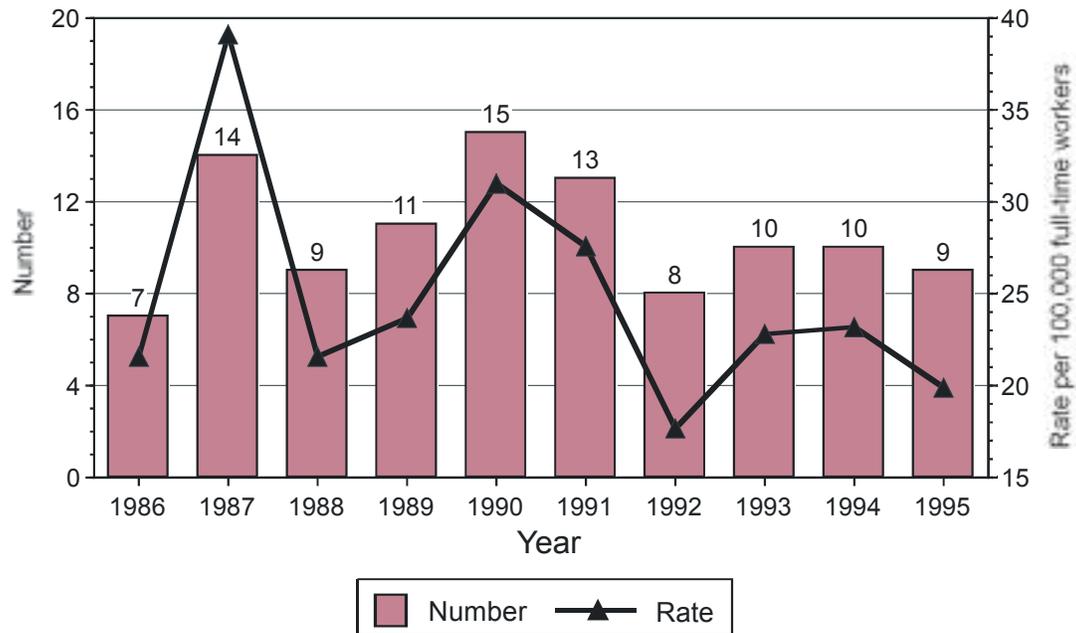


Figure 4B-1.—Metal operators: number and rate (per 100,000 workers) of fatal injuries by year, 1986-1995. (Source: MSHA data)

Table 4B-1.—Metal operators: number and average annual rate (per 100,000 workers) of fatal injuries by subunit, 1986-1995.

<u>Mining operation</u>	<u>Number, 1986-1995</u>	<u>Average annual rate per 100,000 full-time workers</u>
<b>Underground mines:</b>		
Underground operations	56	87.6
Surface operations	5	29.7
<b>Surface mines:</b>		
Strip	31	20.2
Dredge	0	*
Other surface mining	0	*
<b>Independent shops/yards</b>	1	*
<b>Mill</b>	13	7
<b>Office</b>	0	*
<b>Total</b>	<b>106</b>	<b>22</b>

\* Rate not calculated because there were fewer than 3 fatalities

Source: Mine Safety and Health Administration data.

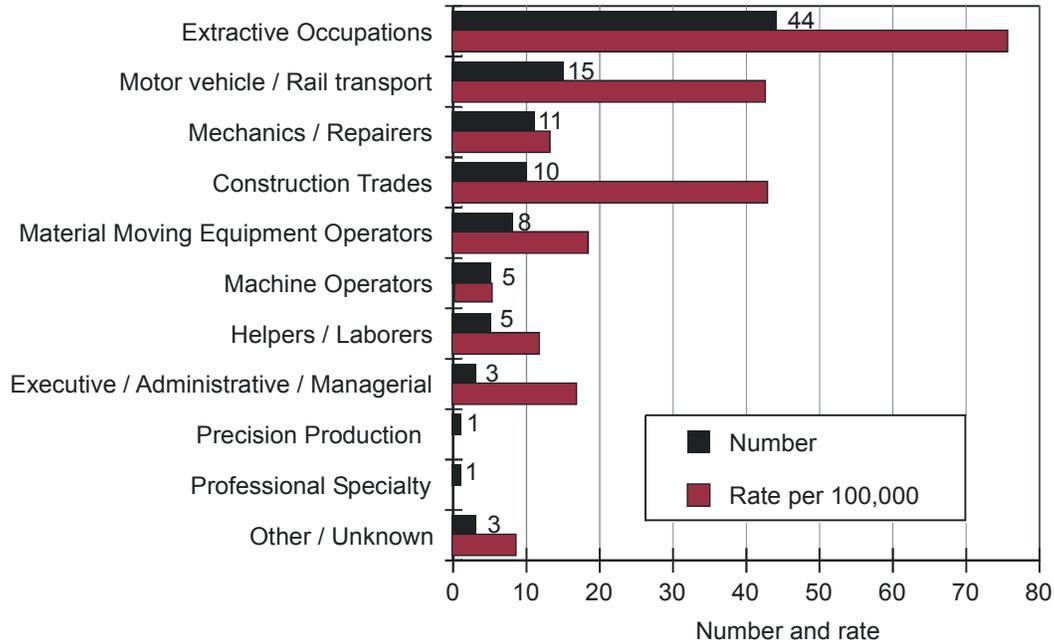


Figure 4B-2.—Metal operators: number and rate (per 100,000 workers) of fatal injuries by U.S. Bureau of the Census Occupation Division, 1996-1995. (Source: MSHA data)

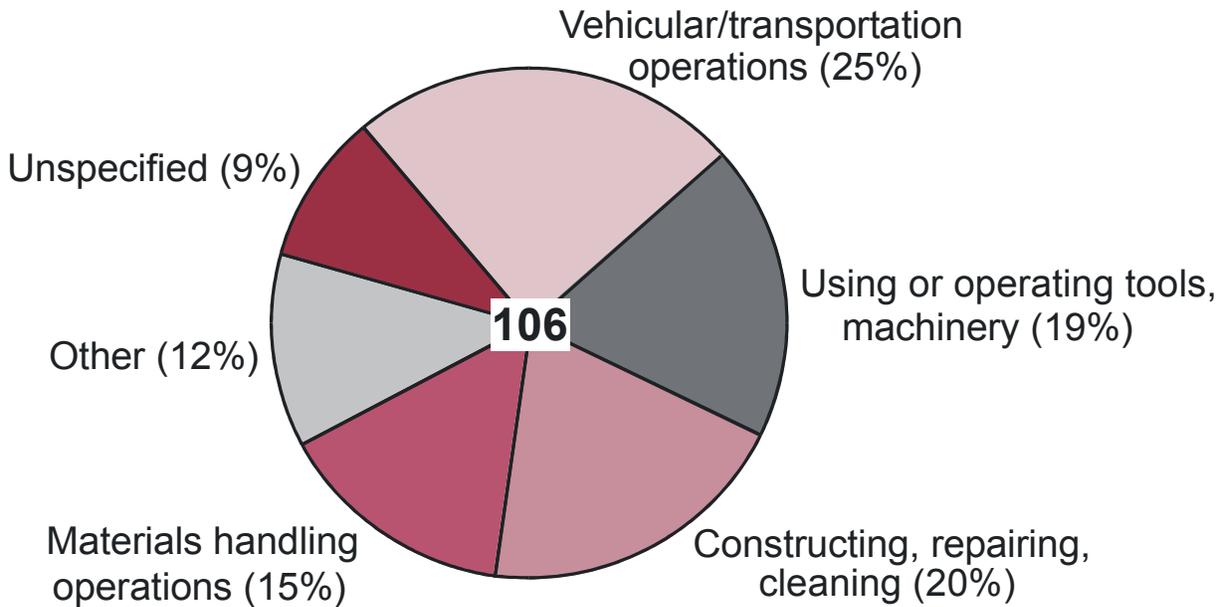


Figure 4B-3.—Metal operators: number of fatal injuries by work activity, 1986-1995. (Source: MSHA data)

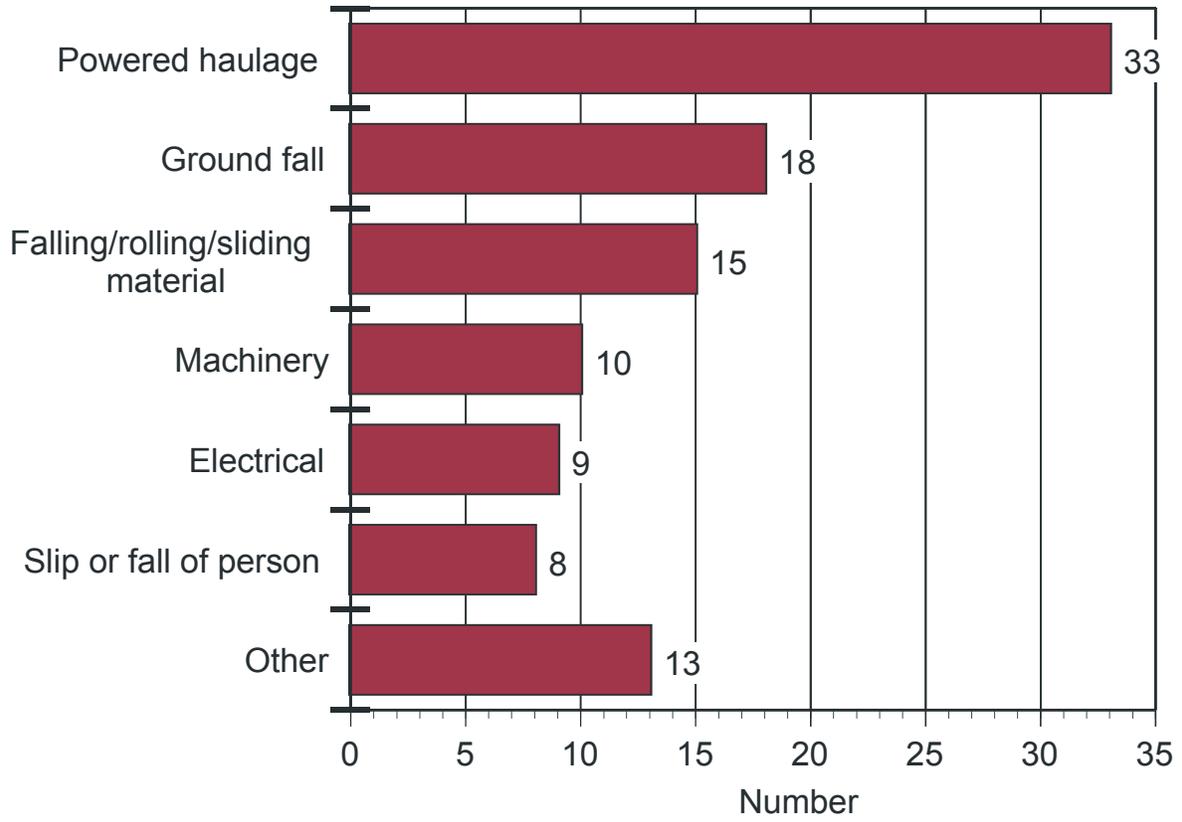


Figure 4B-4.—Metal operators: number of fatal injuries by MSHA accident classification, 1986-1995. (Source: MSHA data)

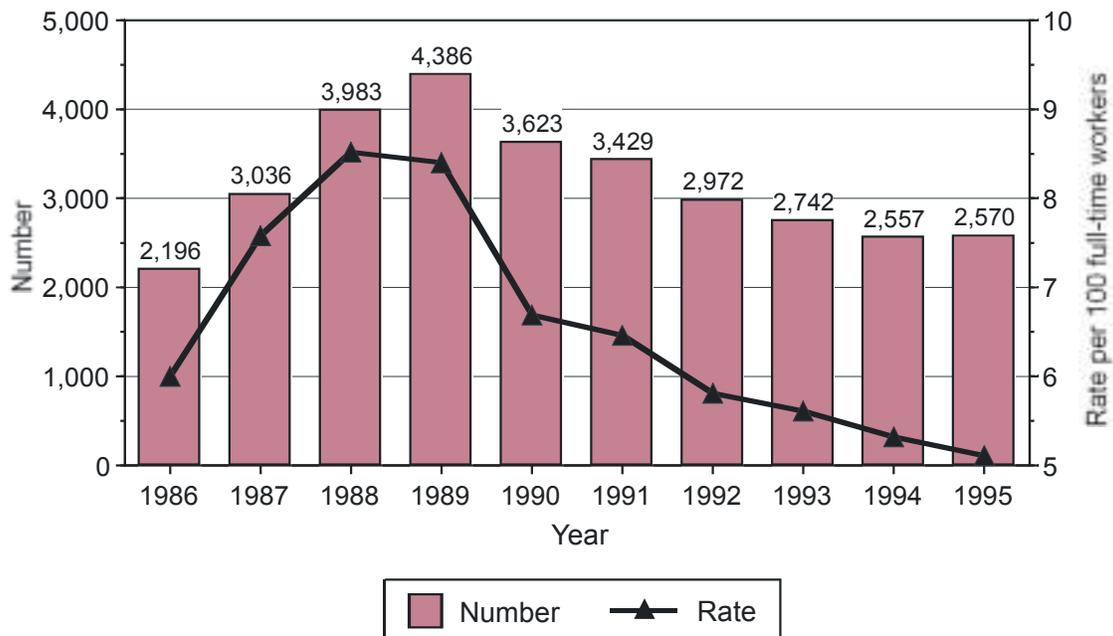


Figure 4B-5.—Metal operators: number and rate (per 100 workers) of nonfatal injuries by year, 1986-1995. (Source: MSHA data)

Table 4B-2.—Metal operators: number and average annual rate (per 100 workers) of nonfatal injuries by subunit, 1986-1995.

<u>Mining operation</u>	<u>Number, 1986-1995</u>	<u>Average annual rate per 100 full-time workers</u>
<b>Underground mines:</b>		
Underground operations	8,177	12.79
Surface operations	1,293	7.67
<b>Surface mines:</b>		
Strip	8,179	5.33
Dredge	417	9.49
Other surface mining	71	9.67
<b>Independent shops/yards</b>	276	6.61
<b>Mill</b>	12,921	6.98
<b>Office</b>	160	0.3
<b>Total</b>	<b>31,494</b>	<b>6.52</b>

Source: Mine Safety and Health Administration data.

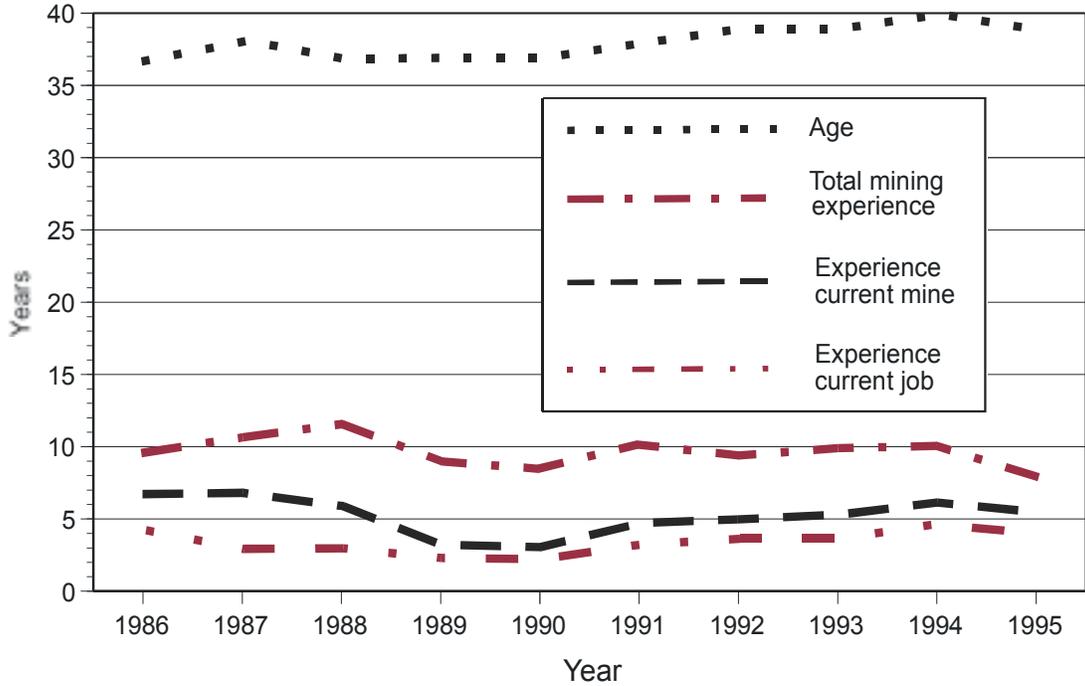


Figure 4B-6.—Metal operators: median values for age, total mining experience, experience in current mine, and experience in current job for workers with nonfatal injuries by year, 1986-1995. (Source: MSHA data)

**Table 4B-3.—Metal operators: nonfatal injuries, 1986-1995, by nature of injury. Number of cases, percentage of cases with one or more lost workdays, mean days lost work per case, total days work lost for all cases, and statutory days charged for all cases.**

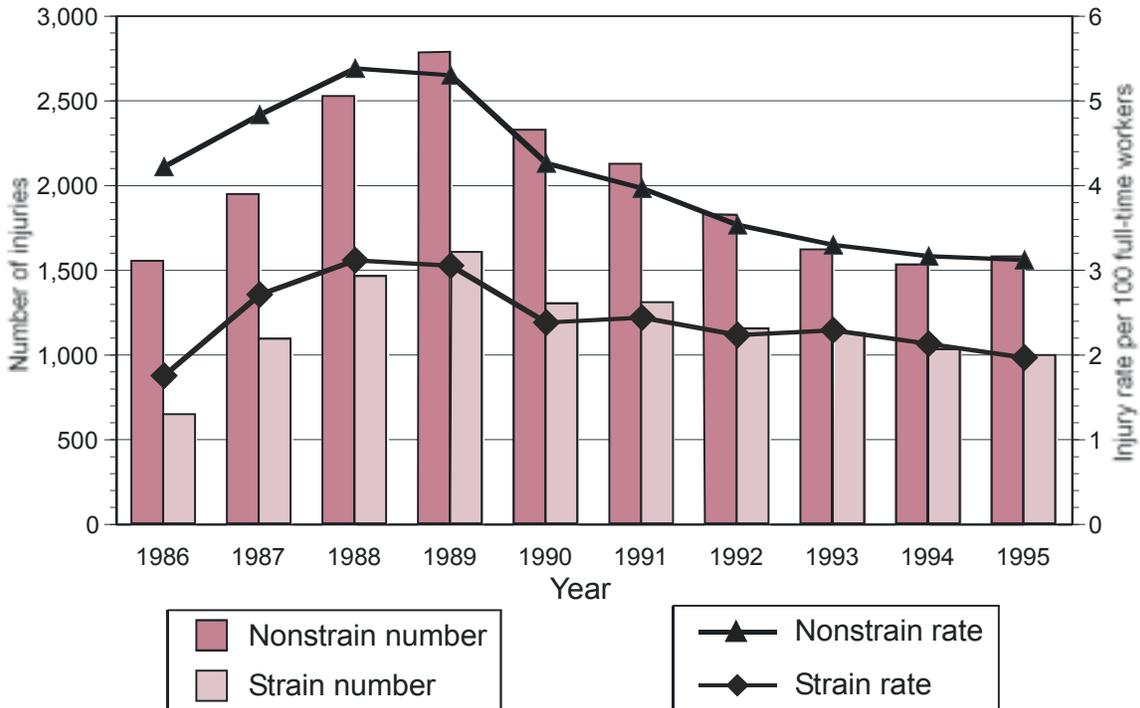
Nature of Injury	Number of cases	Lost workday cases (%)	Mean days lost work	Total days lost	Total statutory days
Sprains and strains	10,761	59.0	21.81	234,696	17,540
Fracture	3,605	43.5	22.86	82,399	15,912
Contusions	2,306	50.4	11.67	26,908	0
Lacerations	7,371	12.8	2.05	15,111	1,870
Hernia	366	82.5	26.12	9,560	13,600
Amputation or enucleation	191	66.5	30.75	5,874	74,025
Dislocation	194	54.6	27.72	5,377	950
Joint, tendon, or muscle inflammation or irritation	247	50.6	21.51	5,313	0
Burn, heat	671	33.2	6.94	4,657	450
Crushing	260	40.0	12.32	3,204	6,950
Burn, chemical	733	32.7	4.32	3,165	0
Noncontact electric arc burn	216	42.1	5.46	1,179	0
Brain concussion	63	79.4	15.59	982	0
Poisoning	166	41.6	4.75	788	0
Abrasions	417	33.3	1.88	784	0
Electrical burn	21	57.1	21.29	447	0
Dust in eyes	705	14.5	0.57	401	0
Electric shock	29	58.6	29.00	269	0
Other specified causes	405	48.9	12.68	5,137	6,943
Multiple injuries, unspecified	2,239	50.0	14.79	44,193	16,785
Other unspecified injuries	528	57.8	22.41	11,835	75
<b>Total</b>	<b>31,494</b>	<b>42.4</b>	<b>14.68</b>	<b>462,279</b>	<b>155,100</b>

Source: Mine Safety and Health Administration data.

**Table 4B-4.—Metal operators: nonfatal injuries, 1986-1995, by work activity. Number of cases, percentage of cases with one or more lost workdays, mean days lost work per case, total days work lost for all cases, and statutory days charged for all cases.**

Work activity	Number of cases	Lost workday cases (%)	Mean days lost work	Total days lost	Total statutory days
Materials handling	9,148	44.9	14.68	134,332	48,010
Using or operating tools or machinery	8,724	32.8	10.32	90,071	32,535
Constructing, repairing or cleaning	5,894	38.7	13.36	78,767	35,735
Vehicular and transportation operations	3,565	55.6	21.86	77,935	7,570
Bodily movement	3,020	50.6	18.85	56,914	6,360
Other	830	47.1	16.71	13,871	20,690
Unspecified	313	62.6	33.19	10,389	4,200
<b>Total</b>	<b>31,494</b>	<b>42.4</b>	<b>14.68</b>	<b>462,279</b>	<b>155,100</b>

Source: Mine Safety and Health Administration data.



**Figure 4B-7.—Metal operators: nonfatal injuries 1986-1995. Number and rate (per 100 workers) of strain and nonstrain injuries by year, 1986-1995. (Source: MSHA data)**

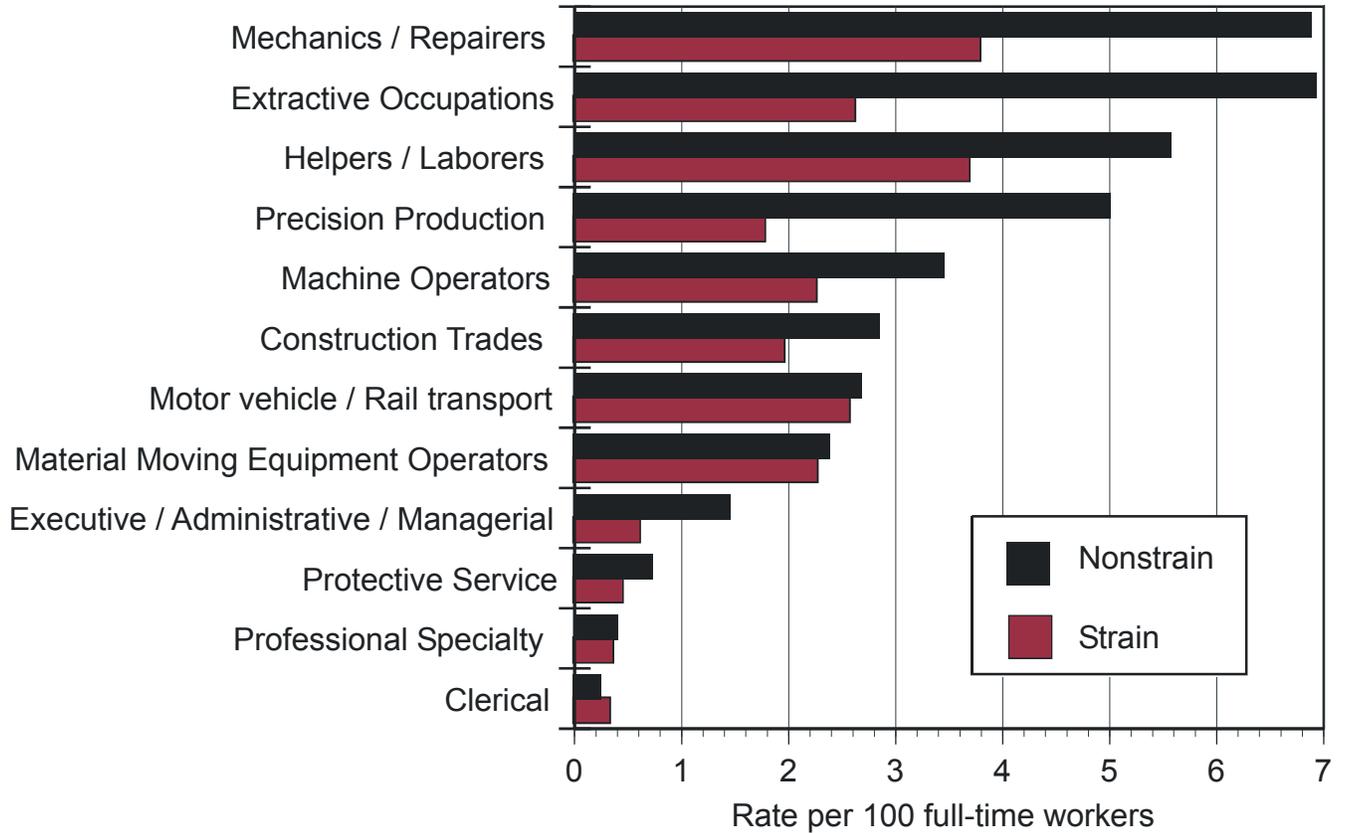


Figure 4B-8.—Metal operators: nonfatal injuries 1986-1995. Number and rate (per 100 workers) of strain and nonstrain injuries by U.S. Bureau of the Census Occupation Division, 1986-1995. (Data on occupations were missing for 915 out of 31,492 cases (2.9%).) (Source: MSHA data)

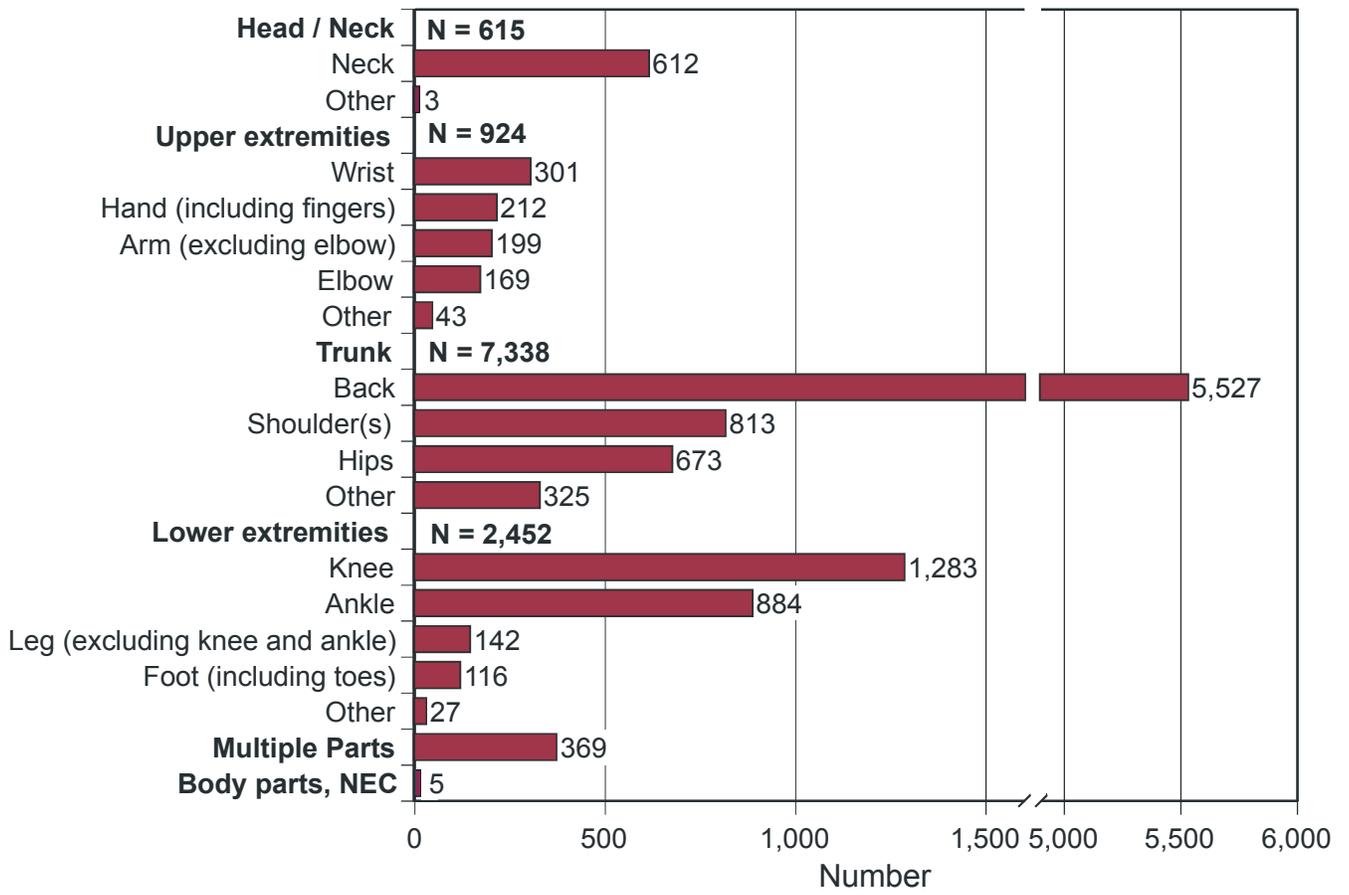


Figure 4B-9.—Metal operators: number of (nonfatal) strain injuries by body part injured, 1986-1995. (Source: MSHA data)

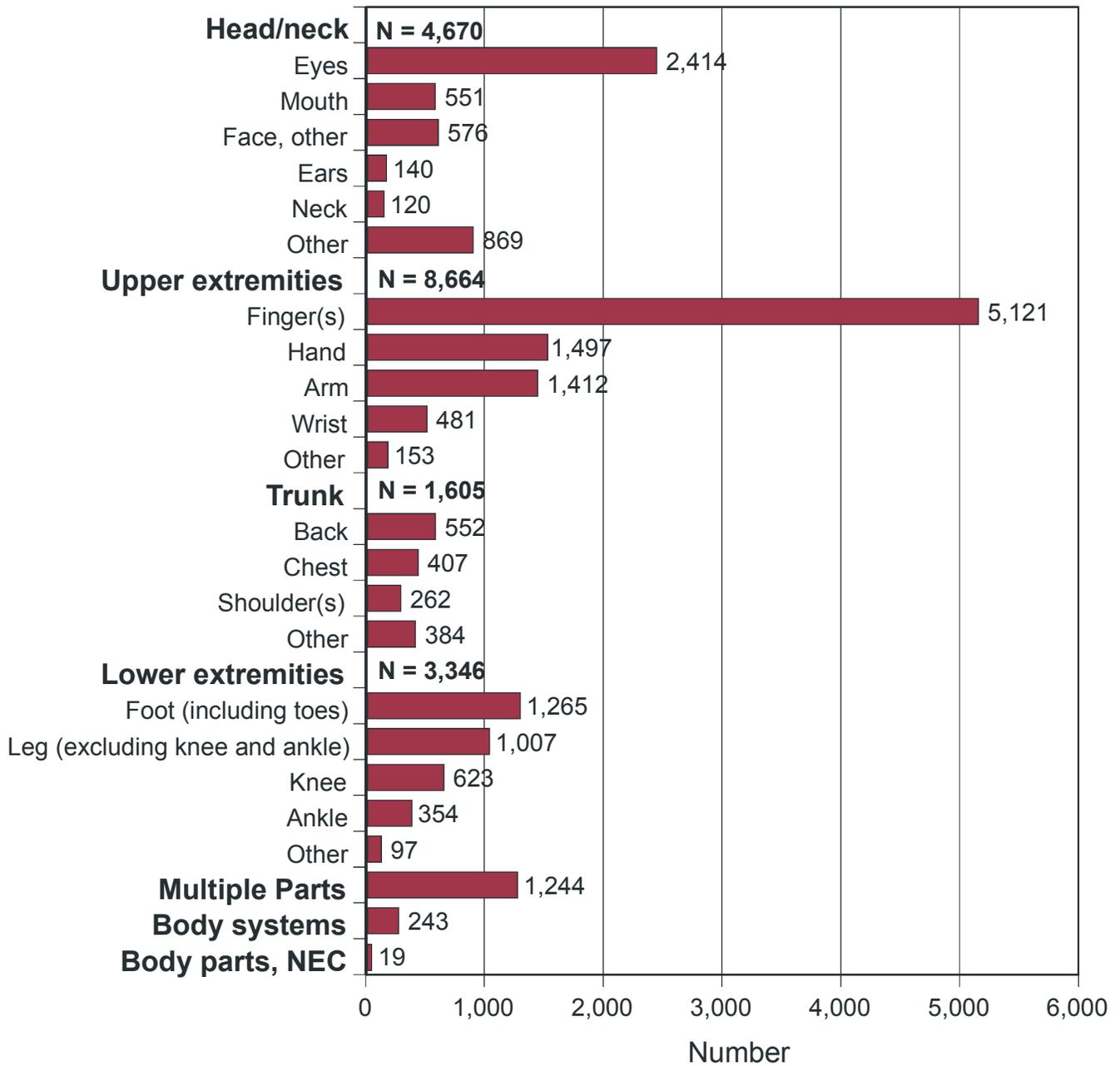


Figure 4B-10.—Metal operators: number of (nonfatal) nonstrain injuries by body part injured, 1986-1995. (Source: MSHA data)

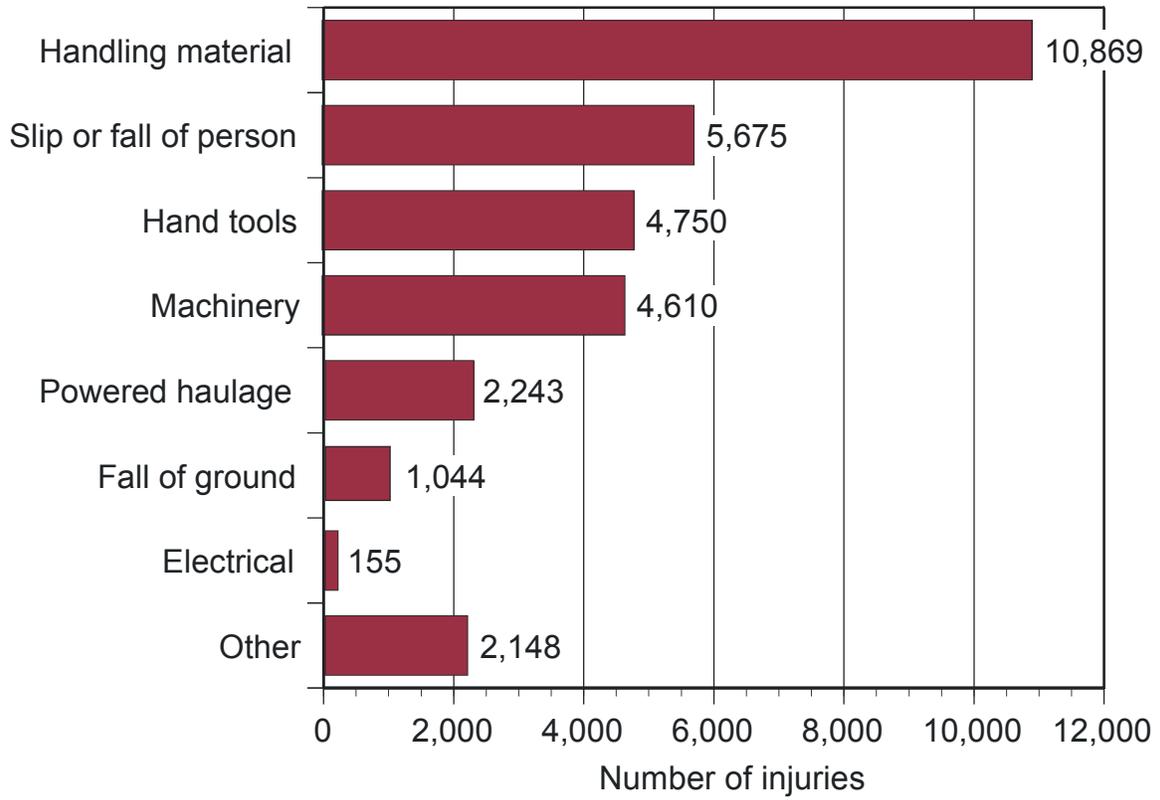
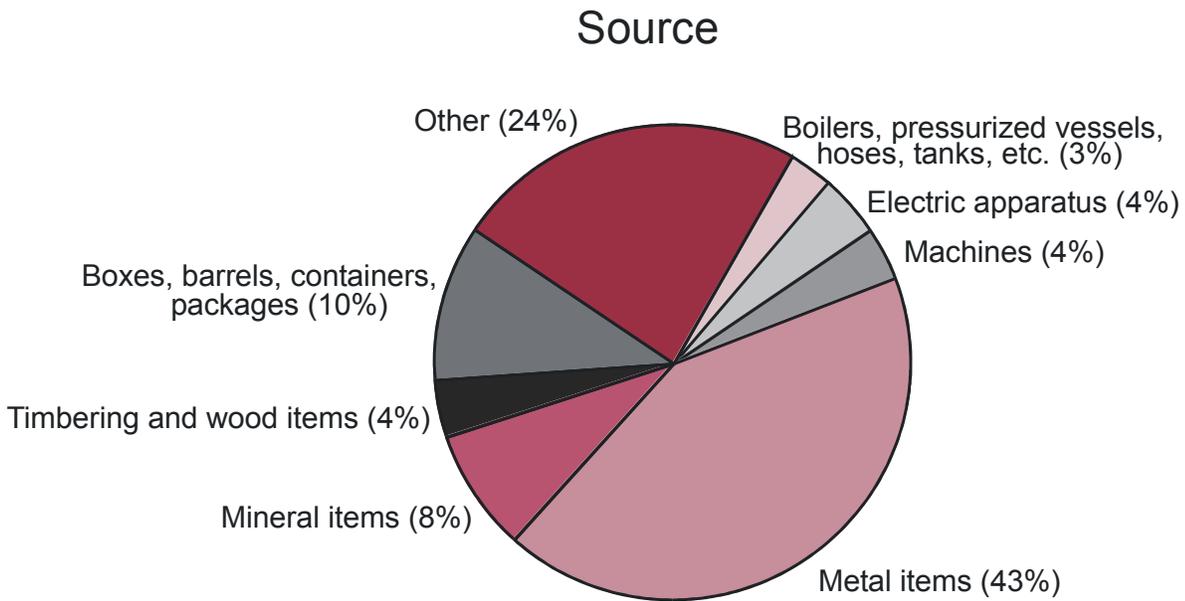
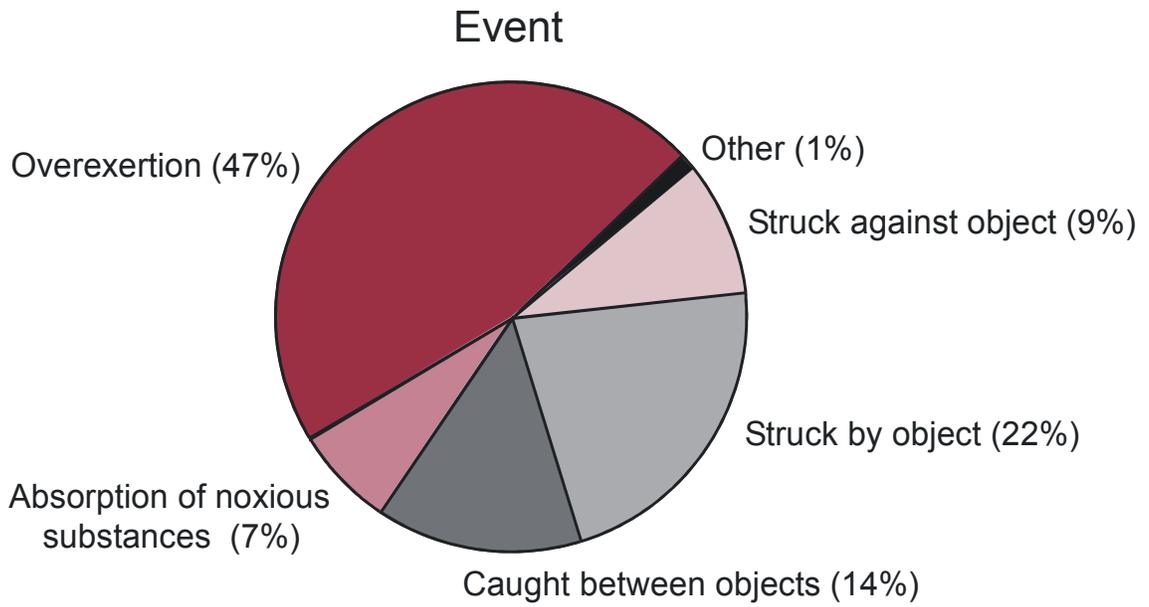


Figure 4B-11.—Metal operators: number of nonfatal injuries by MSHA accident classification, 1986-1995. (Source: MSHA data)



**Figure 4B-12.—Metal operators: nonfatal material handling injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 10,869). (Source: MSHA data)**

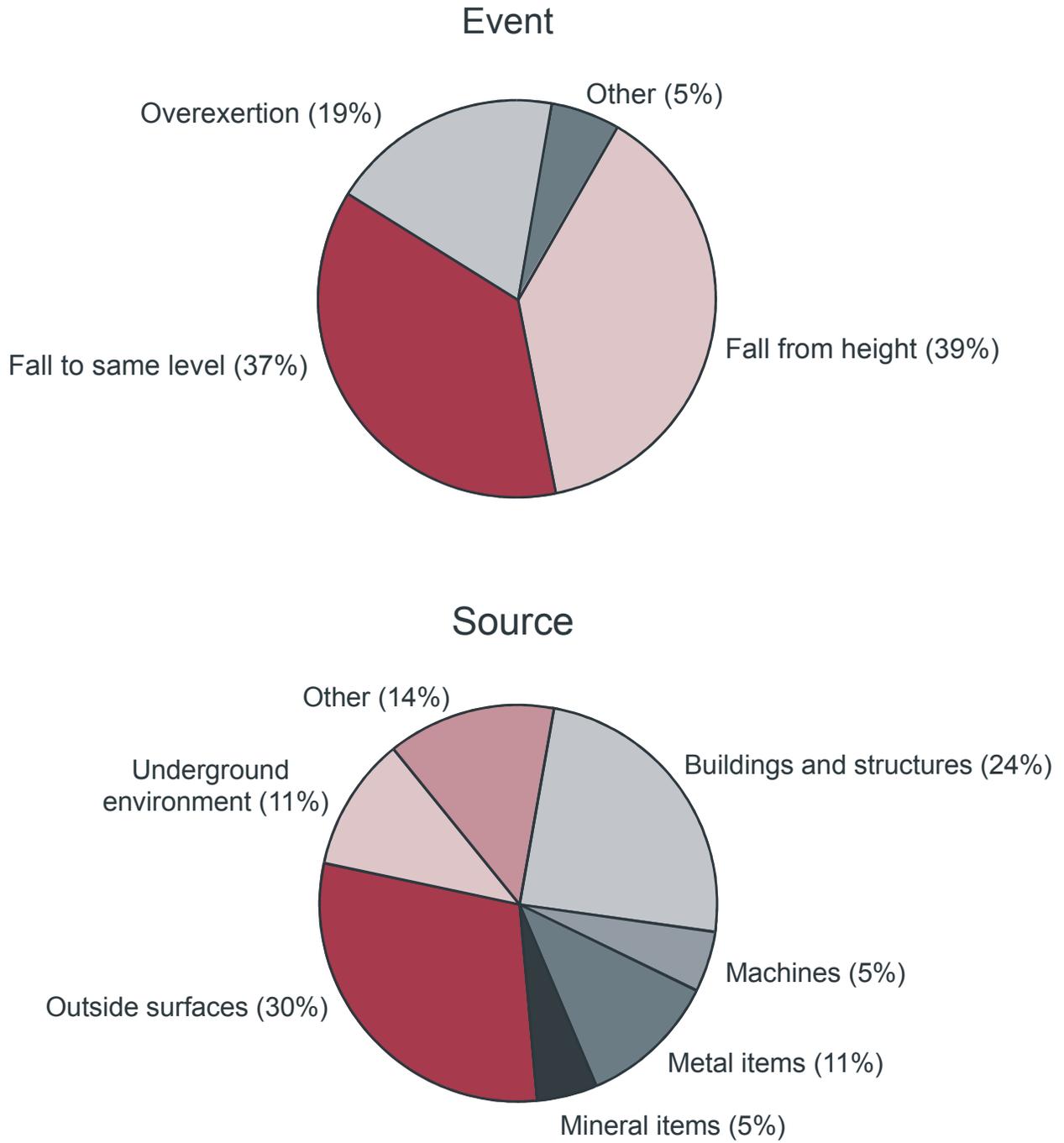
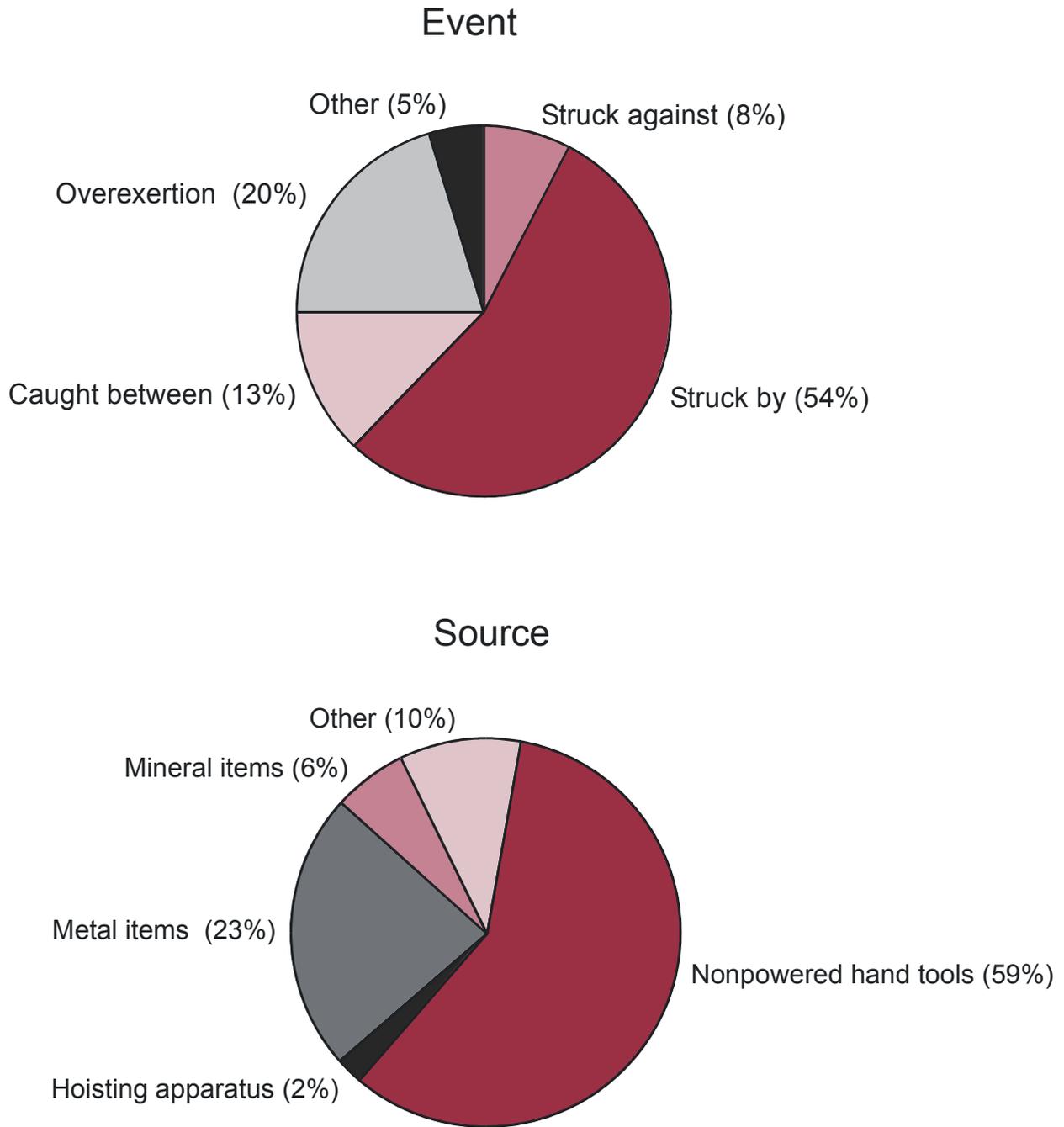


Figure 4B-13.—Metal operators: nonfatal fall injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 5,675). (Source: MSHA data)



**Figure 4B-14.—Metal operators: nonfatal hand tool injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 4,750). (Source: MSHA data)**

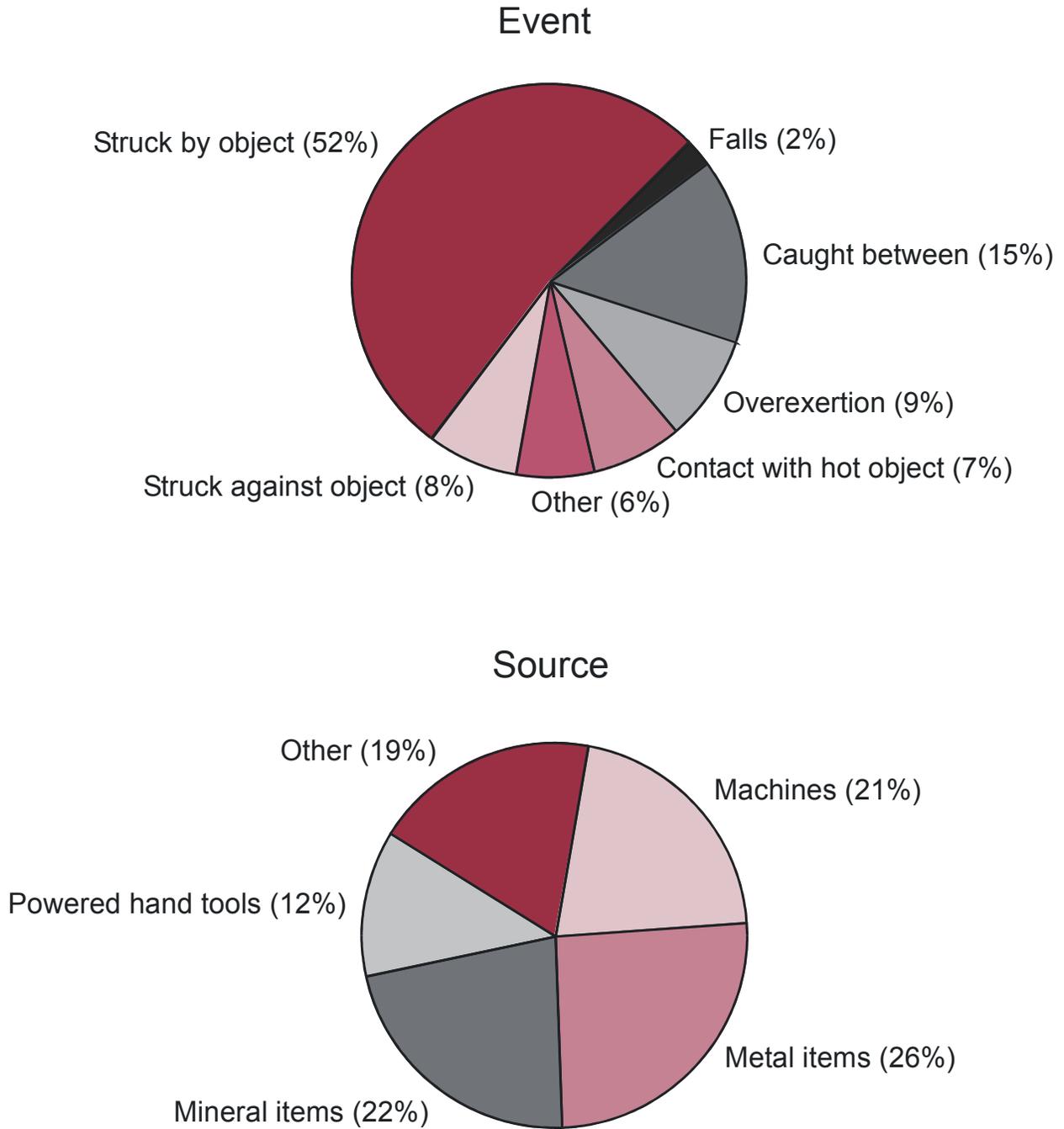


Figure 4B-15.—Metal operators: nonfatal machine injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 4,610). (Source: MSHA data)

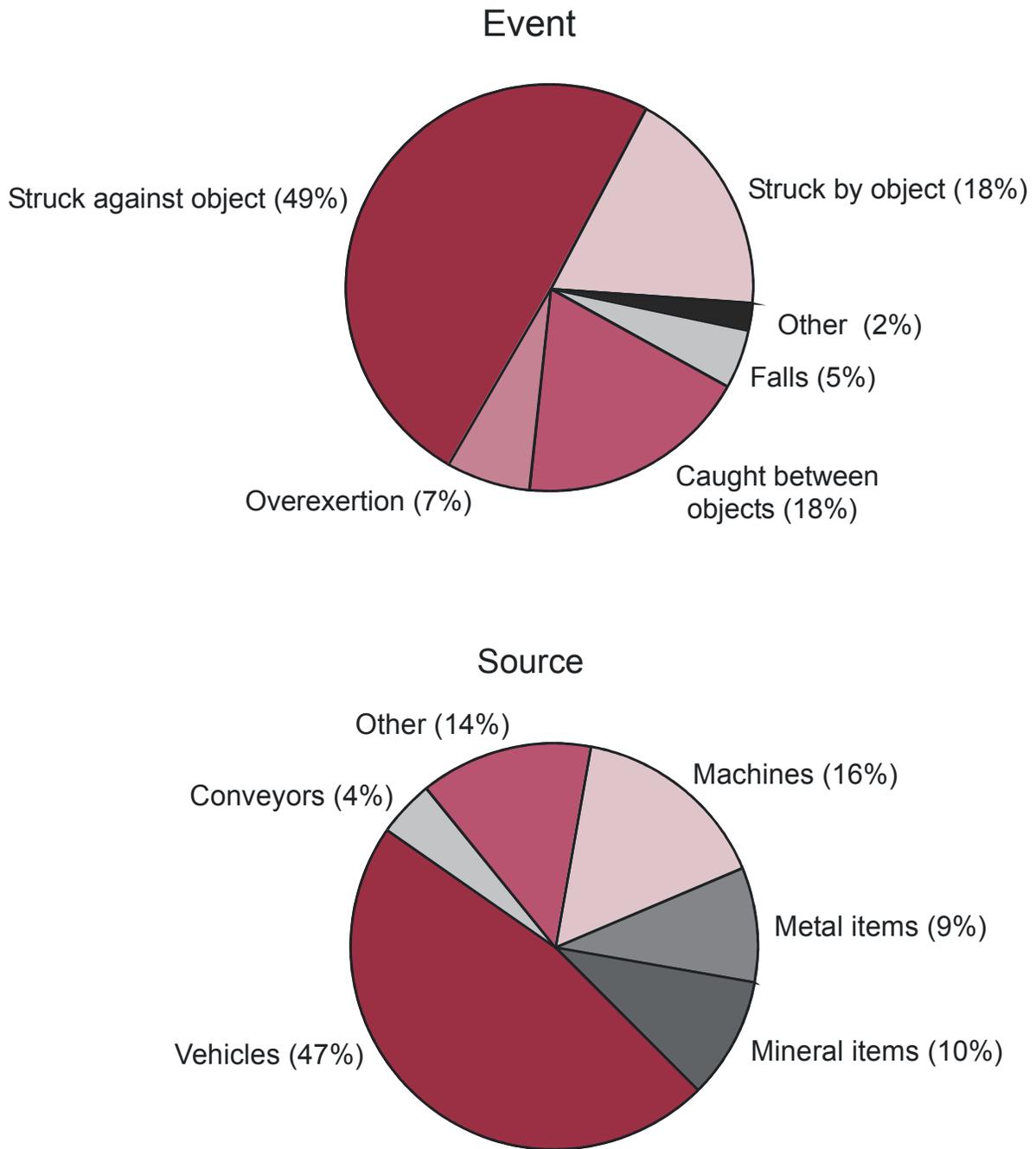


Figure 4B-16.—Metal operators: nonfatal powered haulage injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 2,243). (Source: MSHA data)

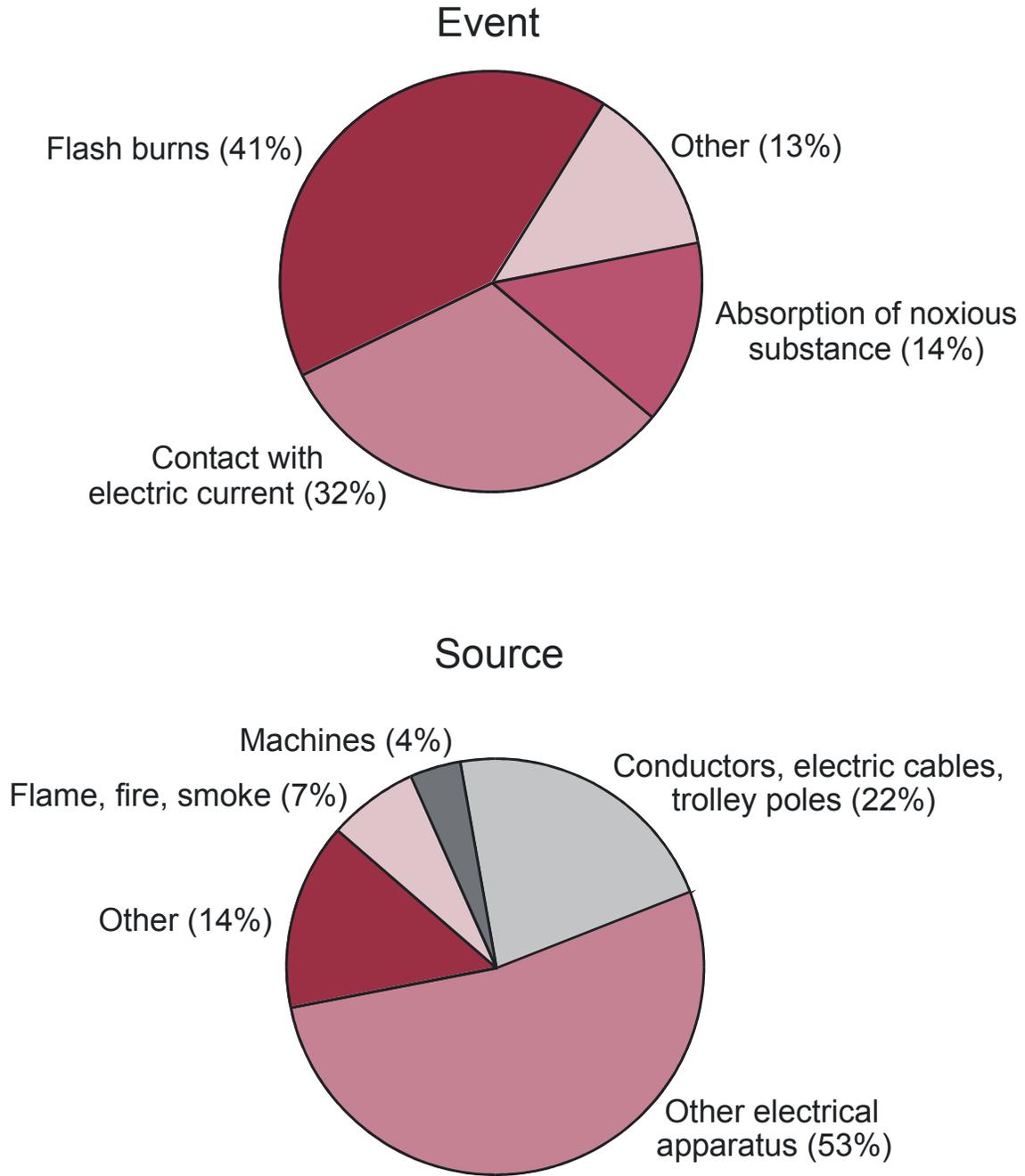


Figure 4B-17.—Metal operators: nonfatal electrical injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 155). (Source: MSHA data)

#### 4C. INJURIES IN NONMETAL MINING

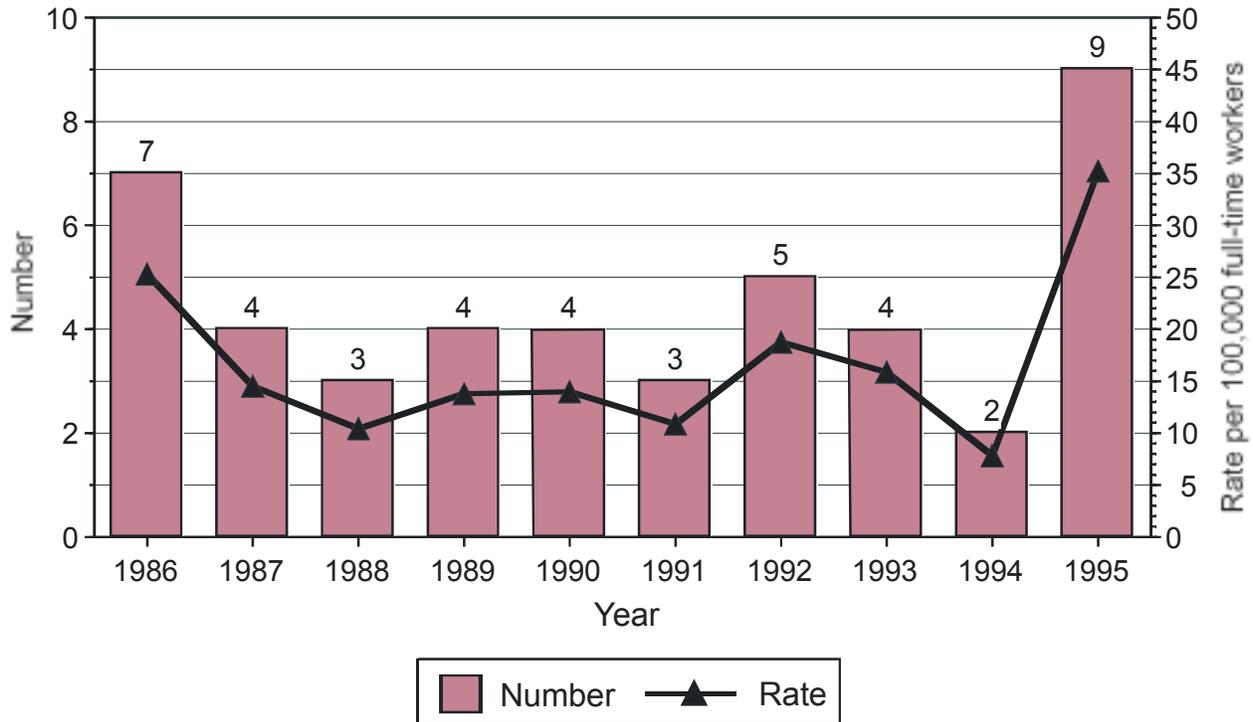


Figure 4C-1.—Nonmetal operators: number and rate (per 100,000 workers) of fatal injuries by year, 1986-1995. (Source: MSHA data)

Table 4C-1.—Nonmetal operators: number and average annual rate (per 100,000 workers) of fatal injuries by subunit, 1986-1995.

<u>Mining operation</u>	<u>Number, 1986-1995</u>	<u>Average annual rate per 100,000 full-time workers</u>
<b>Underground mines:</b>		
Underground operations	16	45.4
Surface operations	0	*
<b>Surface mines:</b>		
Strip	17	28
Dredge	0	*
Other surface mining	0	*
<b>Independent shops/yards</b>	0	0
<b>Mill</b>	12	7.1
<b>Office</b>	0	*
<b>Total</b>	45	14.3

\* Rate not calculated because there were fewer than 3 fatalities

Source: Mine Safety and Health Administration data.

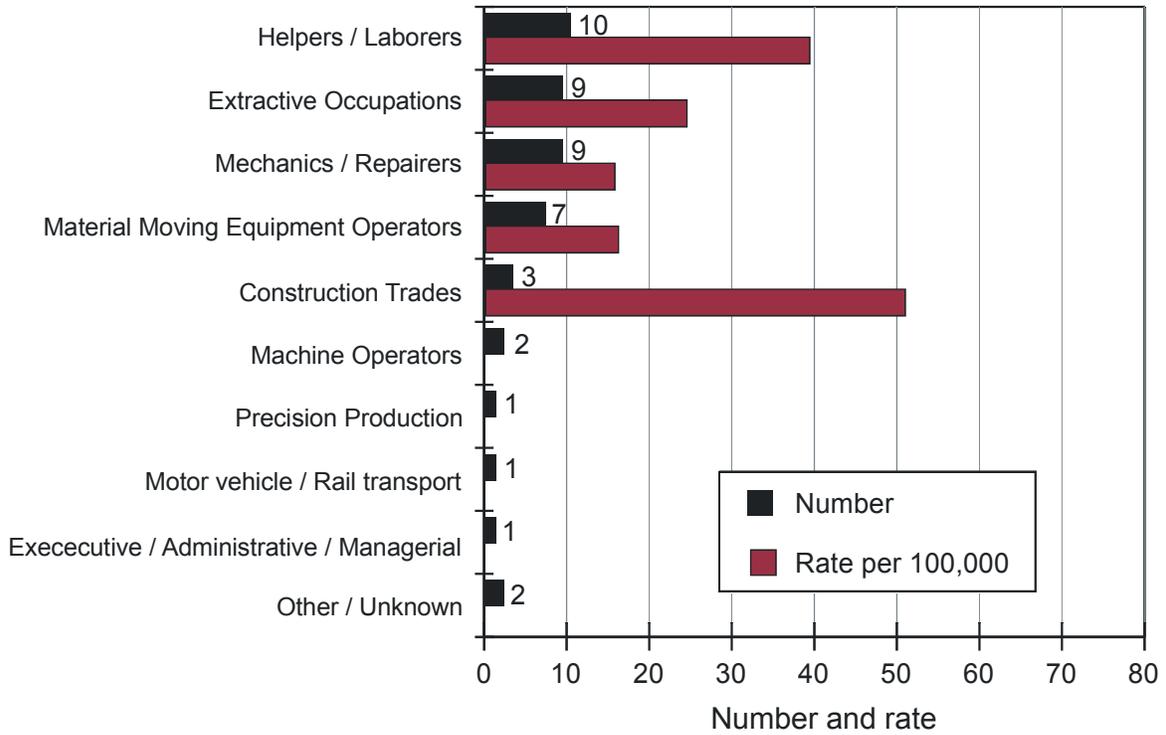


Figure 4C-2.—Nonmetal operators: number and rate (per 100,000 workers) of fatal injuries by U.S. Bureau of the Census Occupation Division, 1986-1995. (Source: MSHA data)

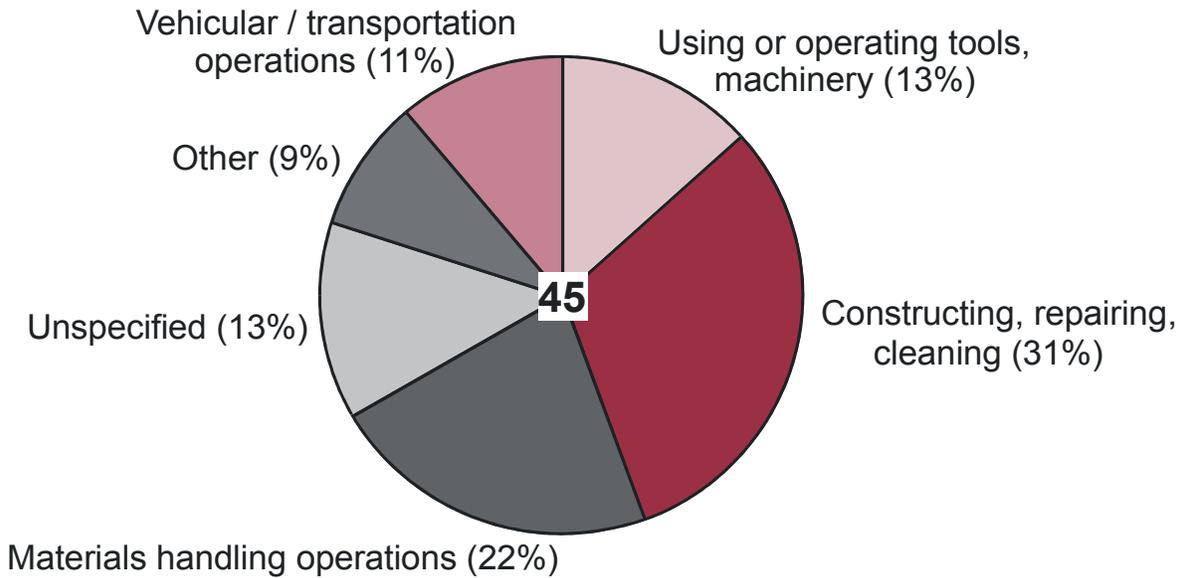


Figure 4C-3.—Nonmetal operators: percent of fatal injuries by work activity, 1986-1995. (Source: MSHA data)

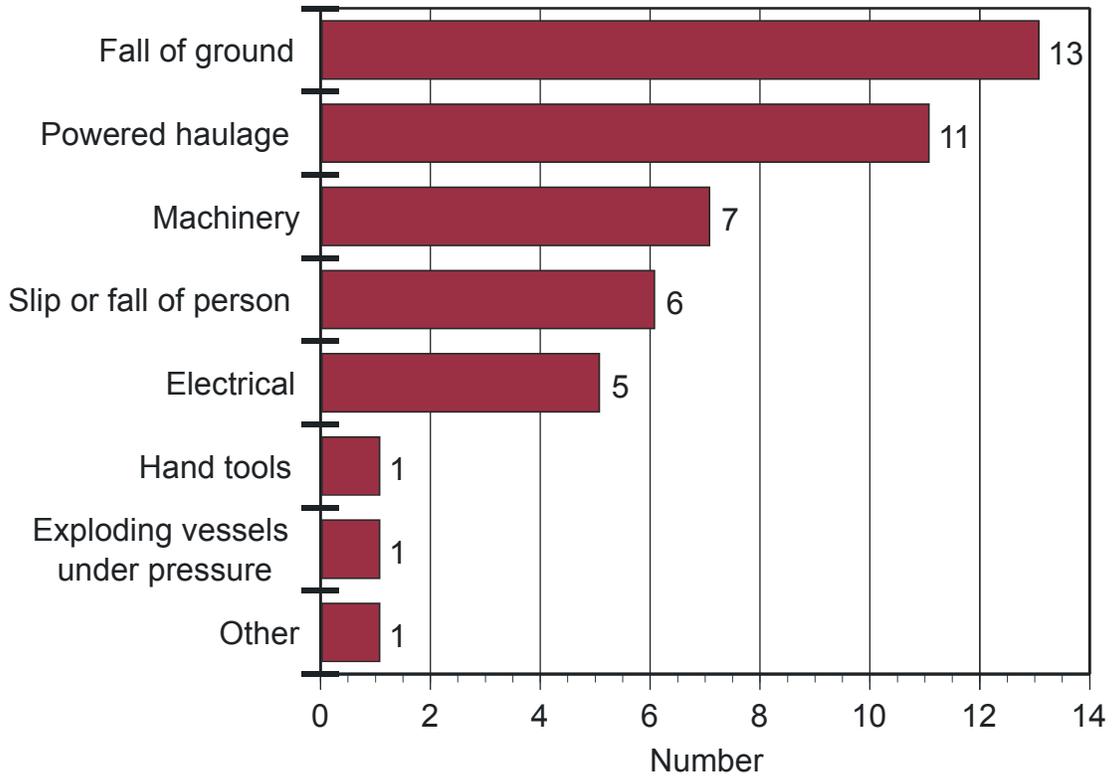


Figure 4C-4.—Nonmetal operators: number of fatal injuries by MSHA accident classification, 1986-1995. (Source: MSHA data)

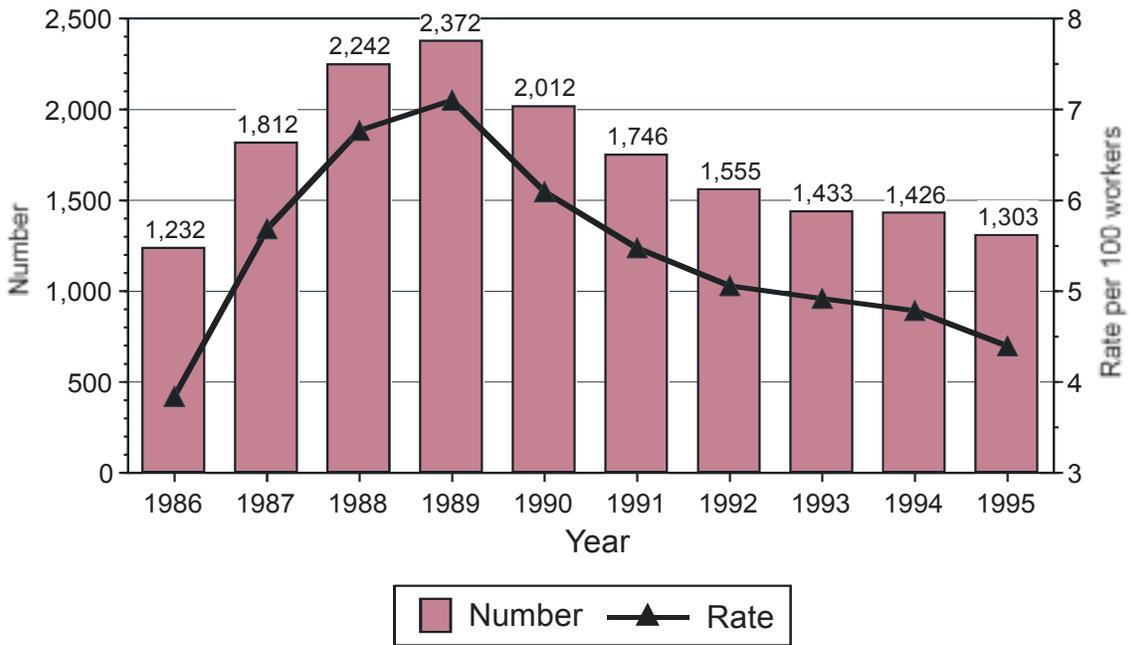


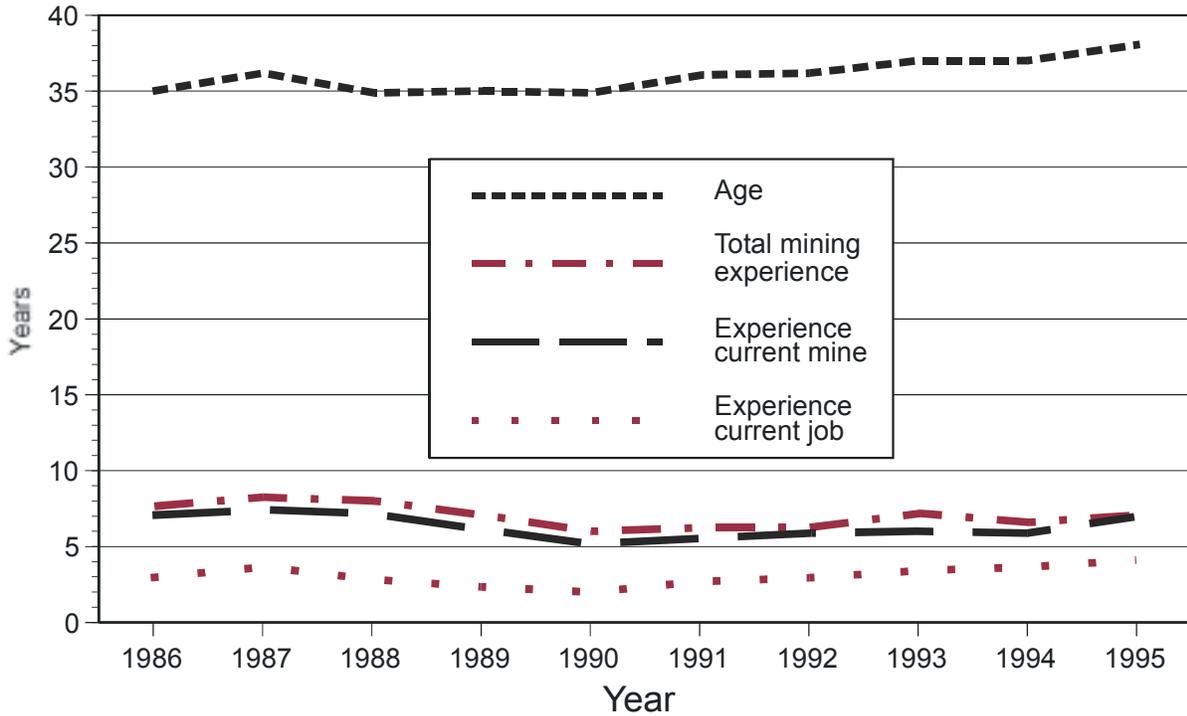
Figure 4C-5.—Nonmetal operators: number and rate (per 100,000 workers) of nonfatal injuries by year, 1986-1995. (Source: MSHA data)

**Table 4C-2.—Nonmetal operators: number and average annual rate (per 100 workers) of nonfatal injuries by subunit, 1986-1995.**

<u>Mining operation</u>	<u>Number, 1986-1995</u>	<u>Average annual rate per 100 full-time workers</u>
<b>Underground mines:</b>		
Underground operations	2,575	7.31
Surface operations	566	8.83
<b>Surface mines:</b>		
Strip	3,043	5.01
Dredge	68	7.99
Other surface mining	1	*
Independent shops/yards	6	8.57
<b>Mill</b>	<b>10,770</b>	<b>6.37</b>
<b>Office</b>	<b>104</b>	<b>0.24</b>
<b>Total</b>	<b>17,133</b>	<b>5.44</b>

\* Rate not calculated because there were fewer than 3 nonfatal injuries

Source: Mine Safety and Health Administration data.



**Figure 4C-6.—Nonmetal operators: median values for age, total mining experience, experience in current mine, and experience in current job for workers with nonfatal injuries by year, 1986-1995. (Source: MSHA data)**

**Table 4C-3.—Nonmetal operators: Nonfatal injuries, 1986-1995, by nature of injury. Number of cases, percentage of cases with one or more lost workdays, mean days lost work per case, total days work lost for all cases, and statutory days charged for all cases.**

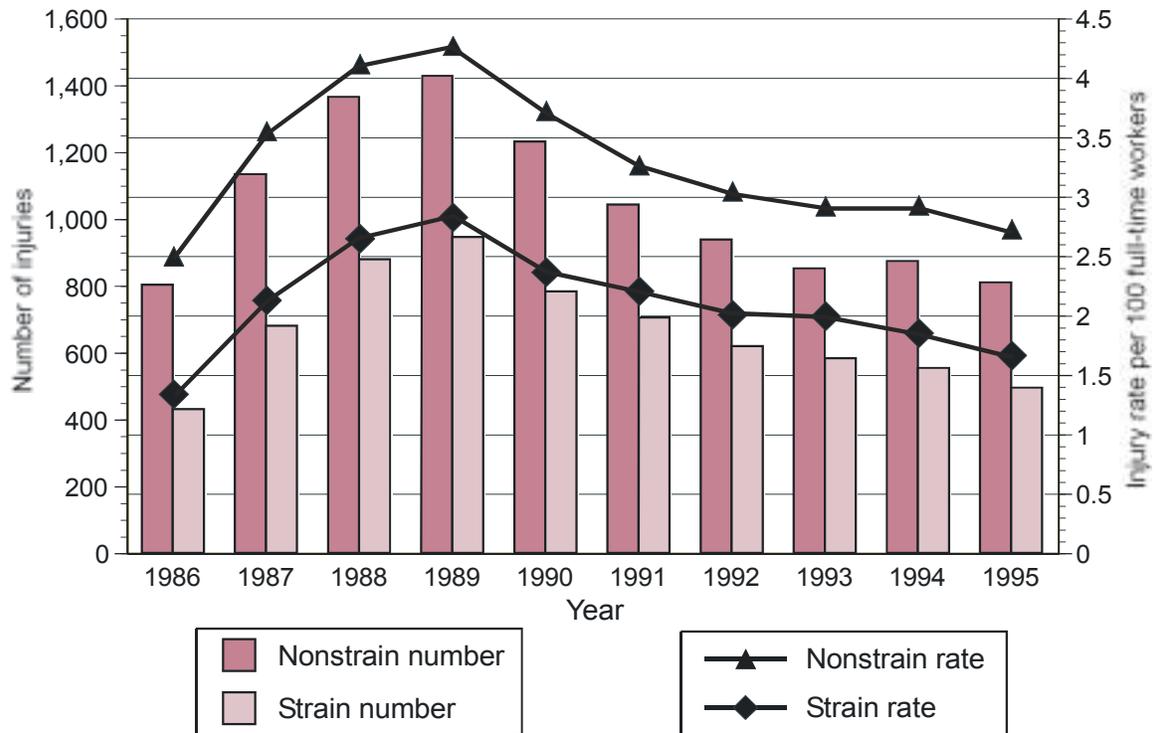
Nature of injury	Number of cases	Lost workday cases (%)	Mean days lost work	Total days lost	Total statutory days
Sprains and strains	6,191	56.2	17.02	105,359	9,520
Fracture	1,362	44.5	22.55	30,713	7,090
Contusions	1,505	42.3	7.38	11,110	0
Lacerations	3,417	14.6	1.90	6,494	350
Hernia	154	78.6	25.71	3,959	6,250
Burn, heat	409	35.9	8.52	3,485	0
Amputation or enucleation	117	53.8	28.58	3,344	63,242
Crushing	211	36.0	8.86	1,870	1,800
Dislocation	96	46.9	17.65	1,694	0
Joint, tendon, or muscle inflammation or irritation	165	40.0	9.76	1,611	50
Burn, chemical	239	29.3	2.77	663	0
Electric shock	32	56.3	19.41	621	0
Noncontact electric arc burn	142	45.1	3.95	561	0
Abrasions	240	27.5	1.36	327	0
Poisoning	103	31.1	3.10	319	0
Dust in eyes	597	23.6	0.53	318	0
Electrical burn	16	43.8	19.25	308	0
Brain concussion	20	70.0	7.65	153	0
Other specified causes	274	40.5	10.17	2,786	6,300
Multiple injuries, unspecified	1,237	44.1	14.77	18,270	19,090
Other unspecified injuries	606	63.5	19.35	11,729	0

Source: Mine Safety and Health Administration data.

**Table 4C-4.—Nonmetal operators: nonfatal injuries, 1986-1995, by work activity. Number of cases, percentage of cases with one or more lost workdays, mean days lost work per case, total days lost for all cases, and statutory days charged for all cases.**

Work activity	Number of cases	Lost workday cases (%)	Mean days lost work	Total days lost	Total statutory days
Materials handling	5,972	46.1	12.58	75,098	14,726
Using or operating tools or machinery	3,984	31.5	8.28	32,997	32,325
Constructing, repairing, or cleaning	3,066	36.5	10.34	31,707	44,691
Vehicular and transportation operations	1,748	51.8	16.56	28,952	15,320
Bodily movement	1,821	49.3	14.89	27,116	1,880
Other	391	44.5	15.24	5,958	4,700
Unspecified	151	61.6	25.60	3,866	50
<b>Total</b>	<b>17,133</b>	<b>42.0</b>	<b>12.01</b>	<b>205,694</b>	<b>113,692</b>

Source: Mine Safety and Health Administration data.



**Figure 4C-7.—Nonmetal operators: nonfatal injuries 1986-1995. Number and rate (per 100 workers) of strain and nonstrain injuries by year, 1986-1995. (Source: MSHA data)**

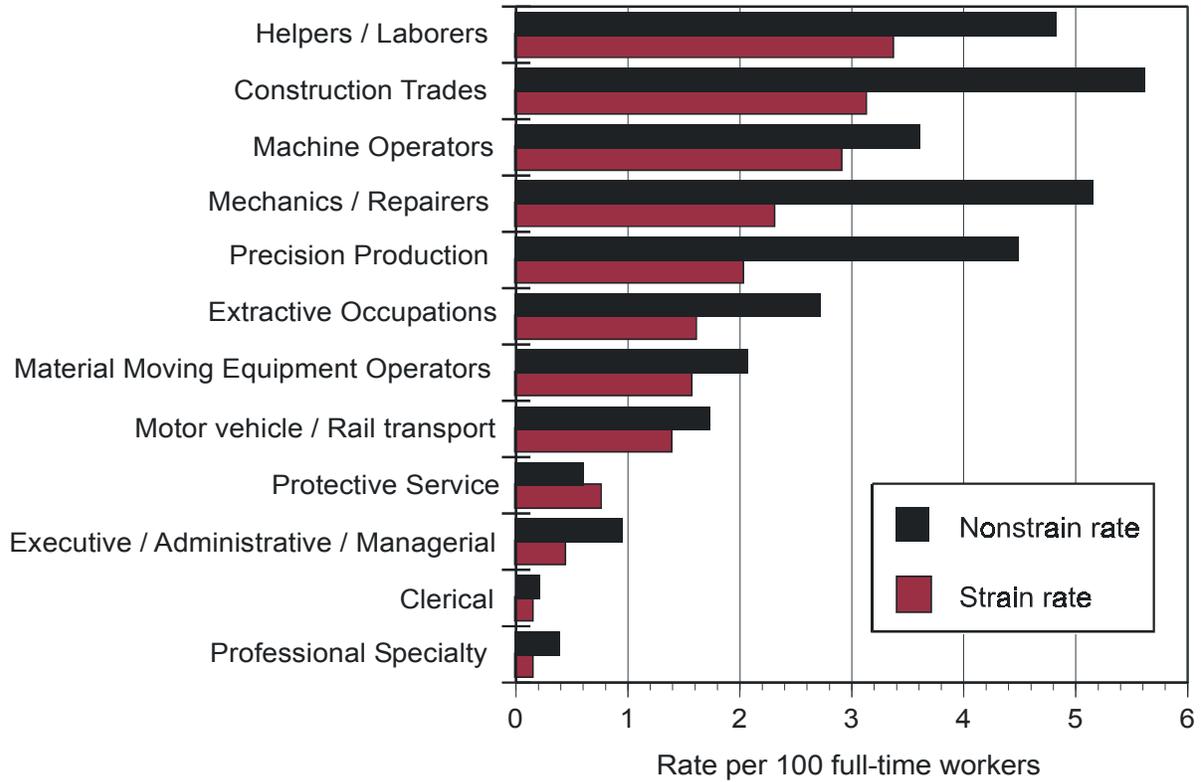


Figure 4C-8.—Nonmetal operators: nonfatal injuries, 1986-1995. Rate (per 100 workers) of strain and nonstrain injuries by U.S. Bureau of the Census Occupation Division, 1986-1995. (Data on occupations were missing for 500 out of 17,133 cases (2.9%).) (Source: MSHA data)

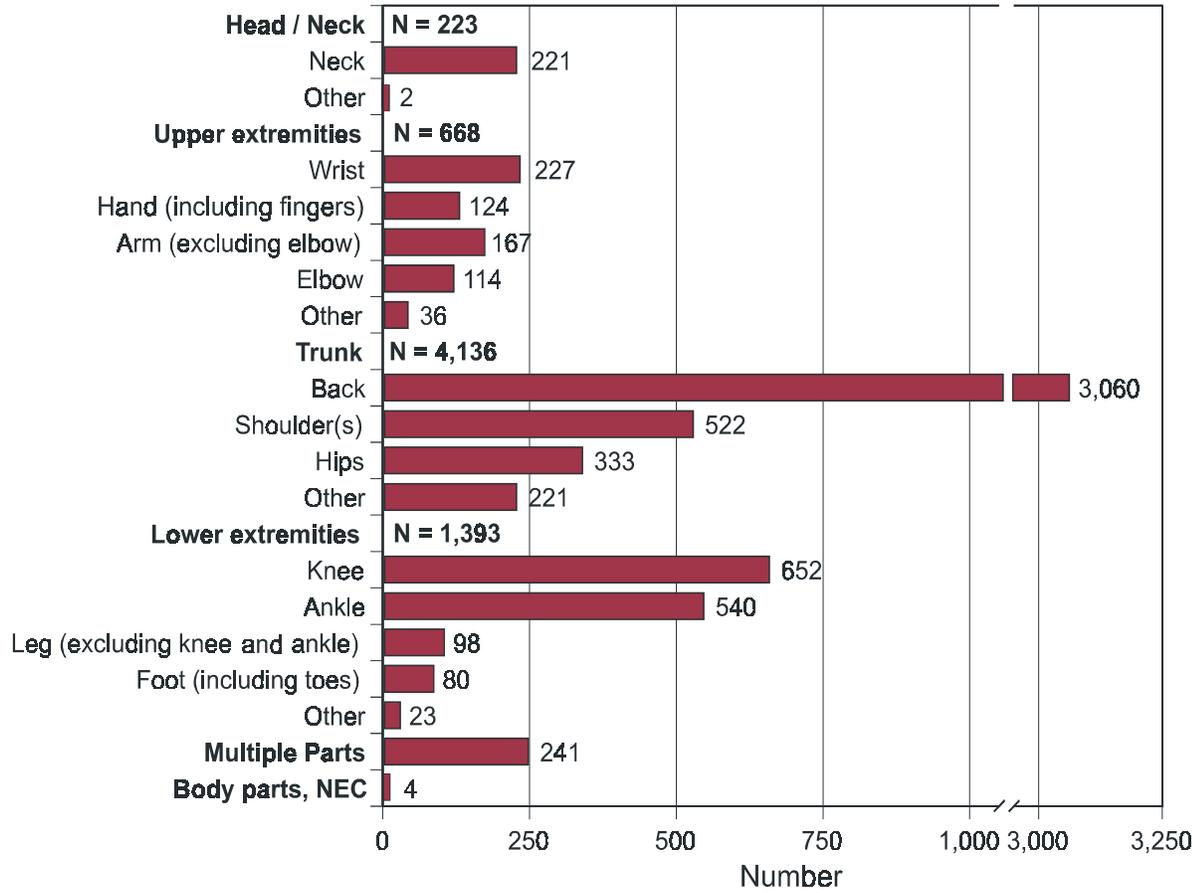


Figure 4C-9.—Nonmetal operators: number of (nonfatal) strain injuries by body part injured, 1986-1995. (Source: MSHA data)

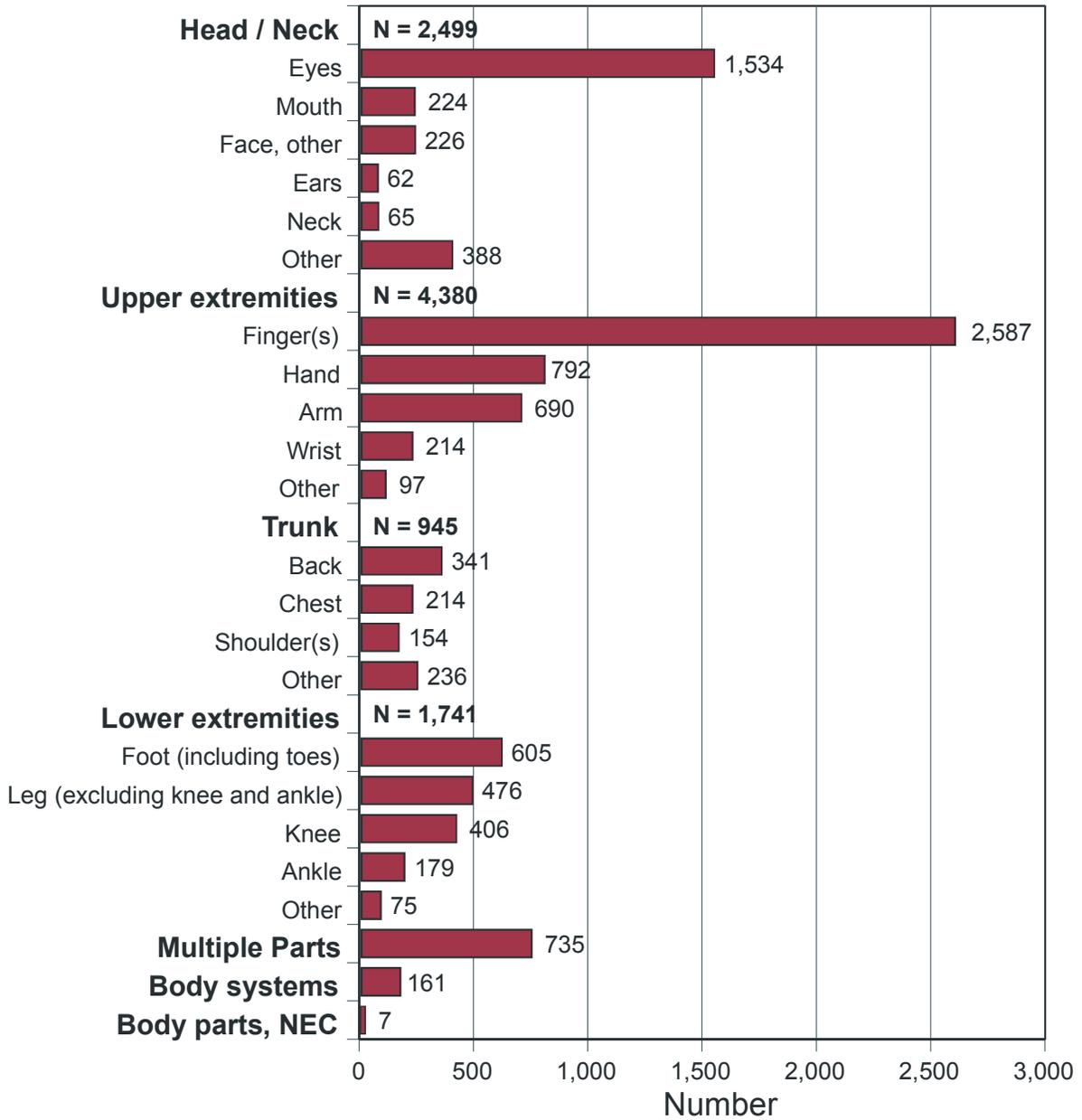


Figure 4C-10.—Nonmetal operators: number of (nonfatal) nonstrain injuries by body part injured, 1986-1995. (Source: MSHA data)

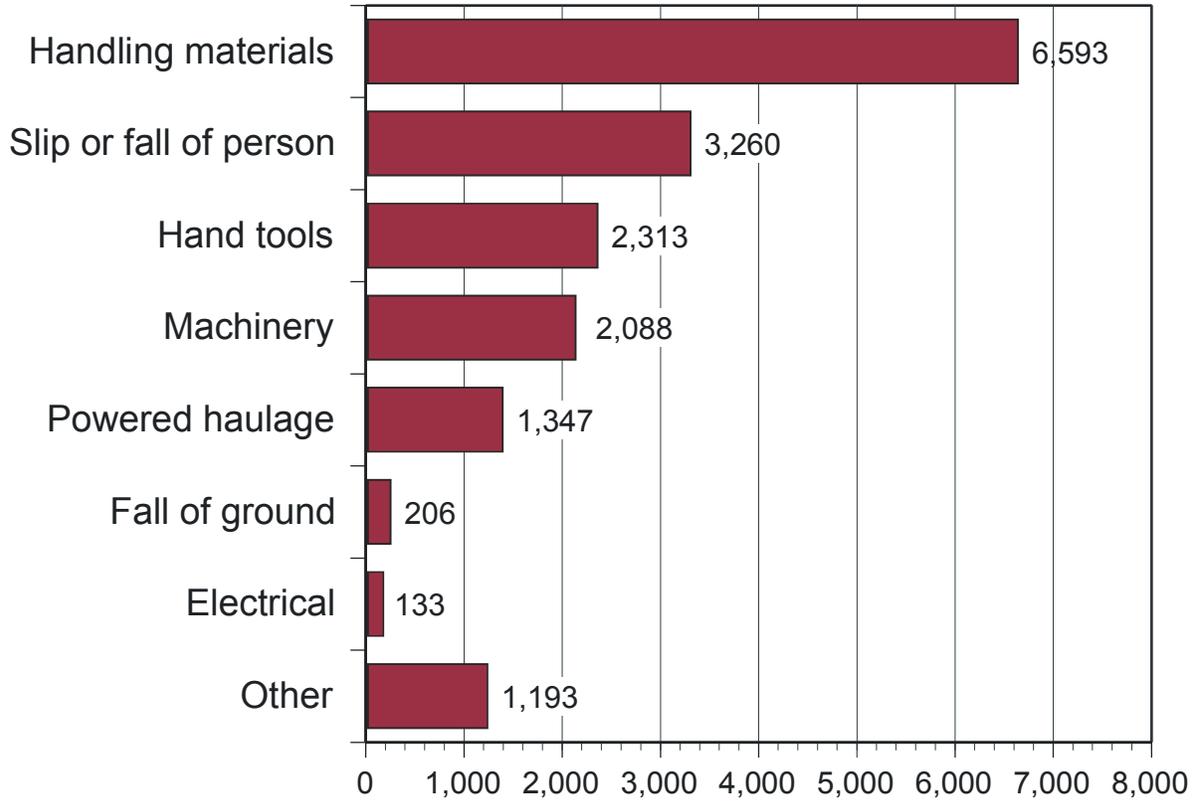


Figure 4C-11.—Nonmetal operators: number of nonfatal injuries by MSHA accident classification, 1986-1995. (Source: MSHA data)

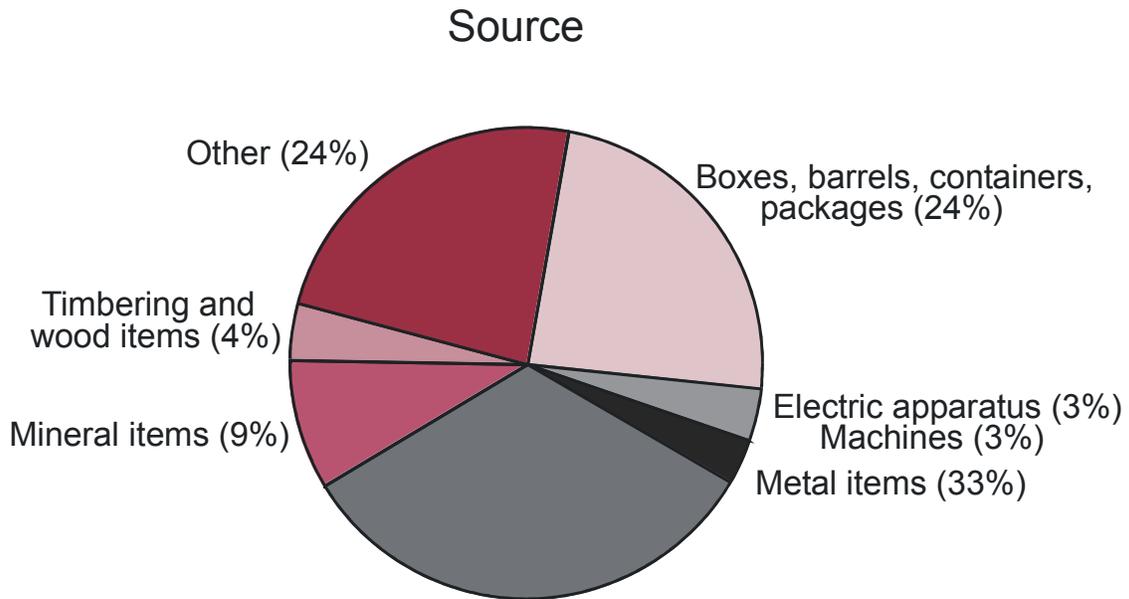
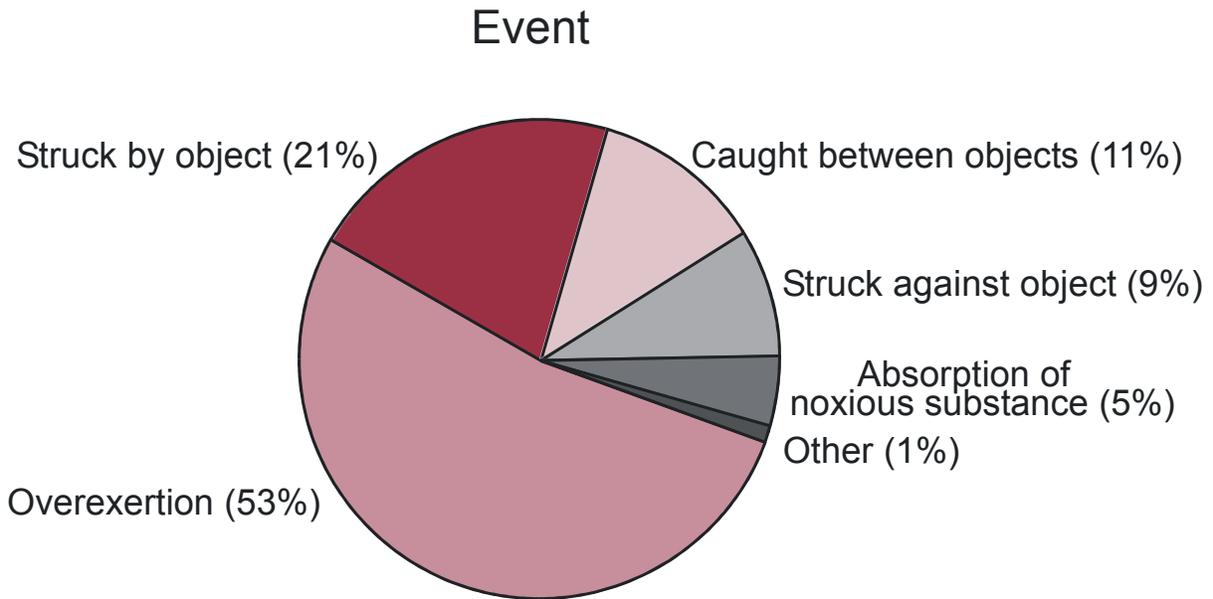
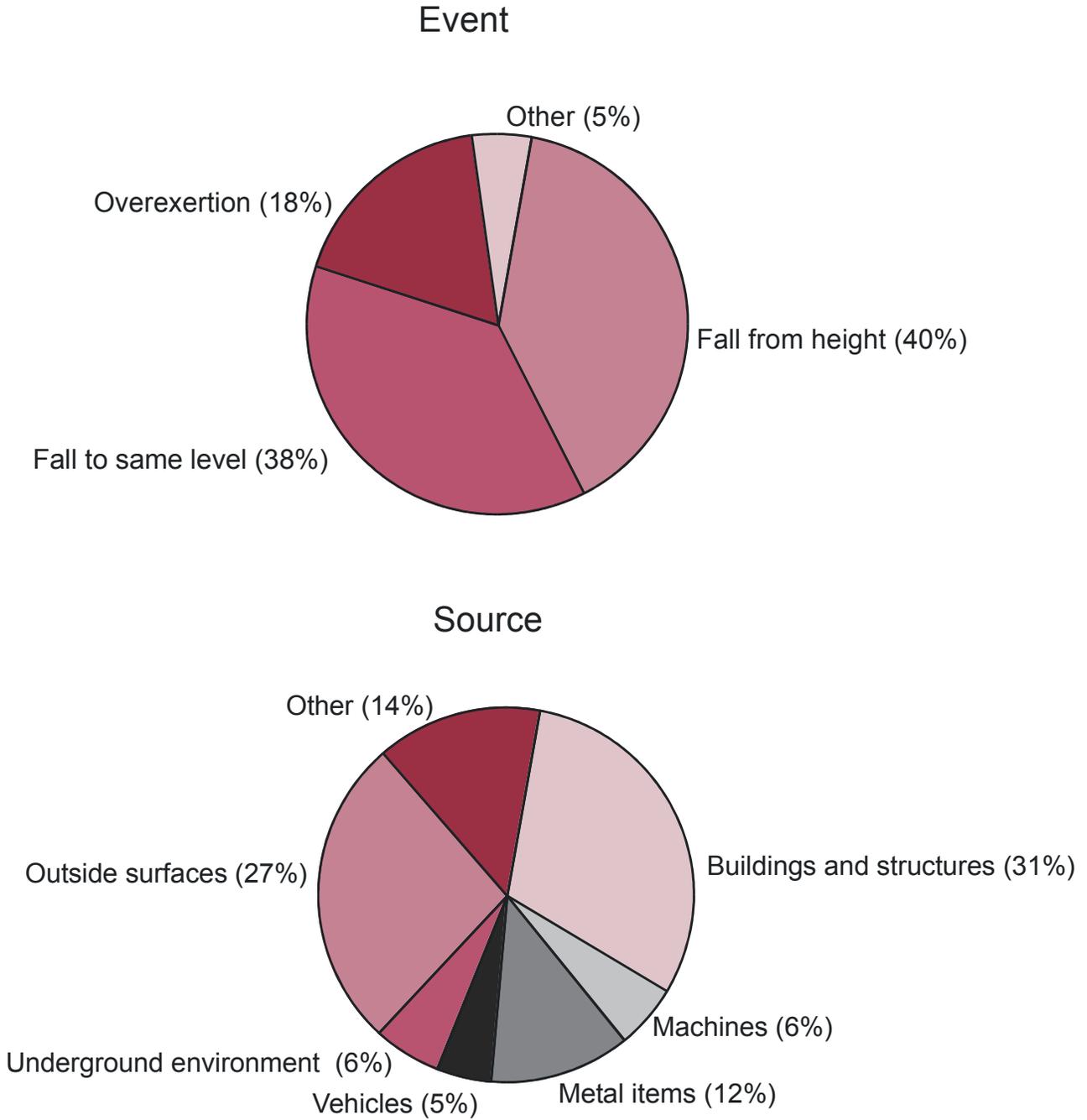


Figure 4C-12.—Nonmetal operators: nonfatal material handling injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 6,593). (Source: MSHA data)



**Figure 4C-13.—Nonmetal operators: nonfatal fall injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 3,260). (Source: MSHA data)**

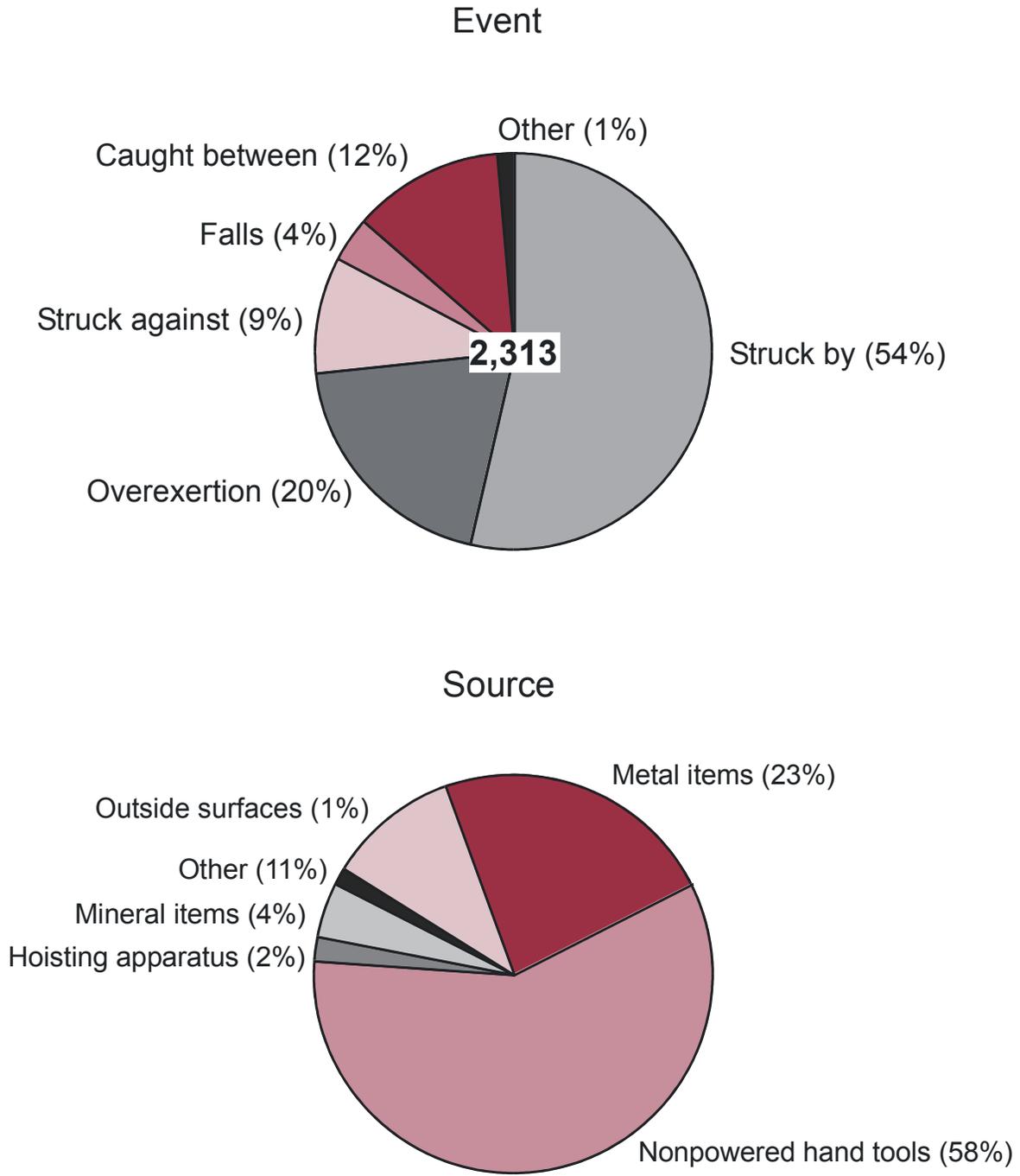


Figure 4C-14.—Nonmetal operators: nonfatal hand tool injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 2,313). (Source: MSHA data)

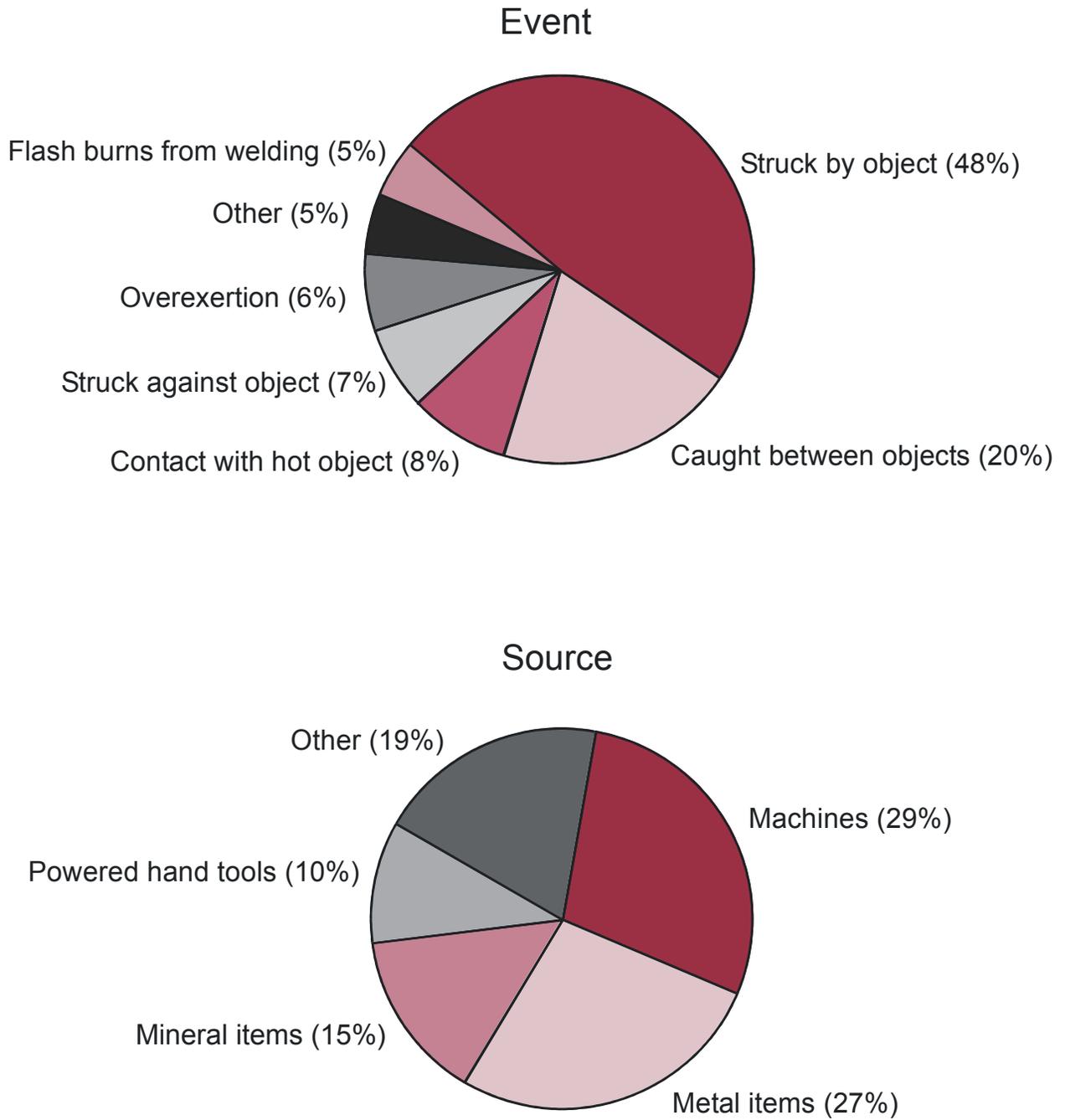


Figure 4C-15.—Nonmetal operators: nonfatal machine injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 2,088). (Source: MSHA data)

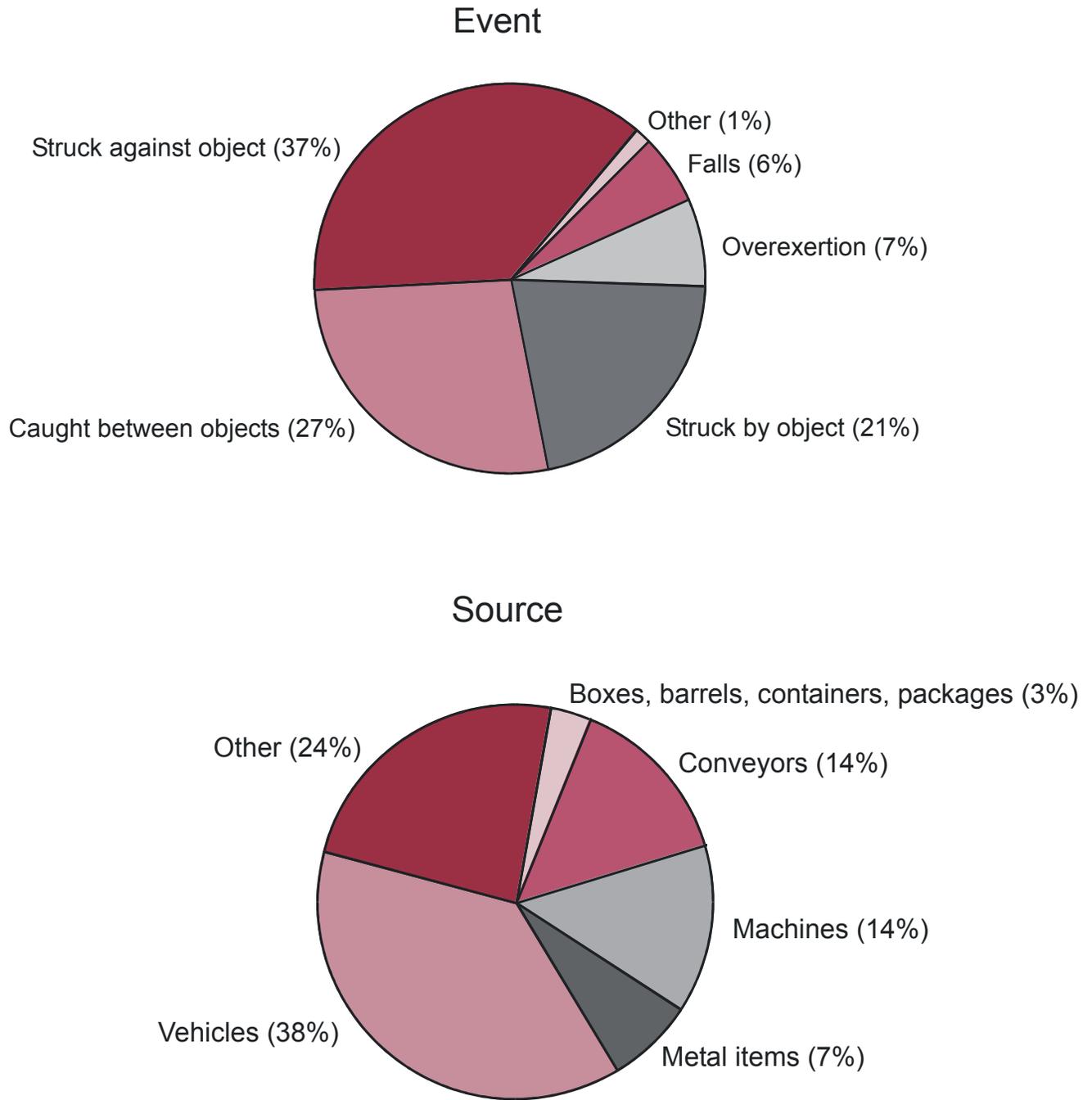
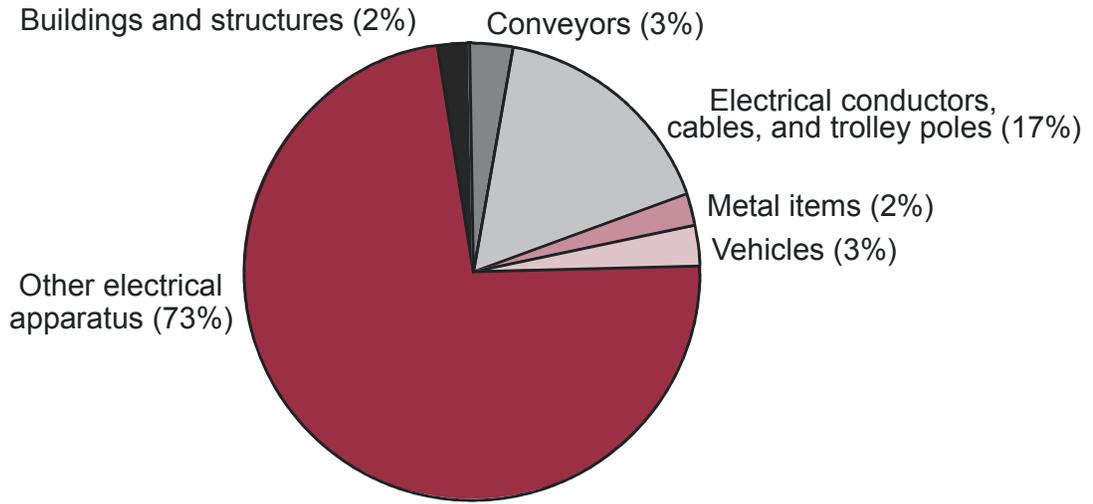


Figure 4C-16.—Nonmetal operators: nonfatal powered haulage injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 1,347). (Source: MSHA data)

### Source



### Event

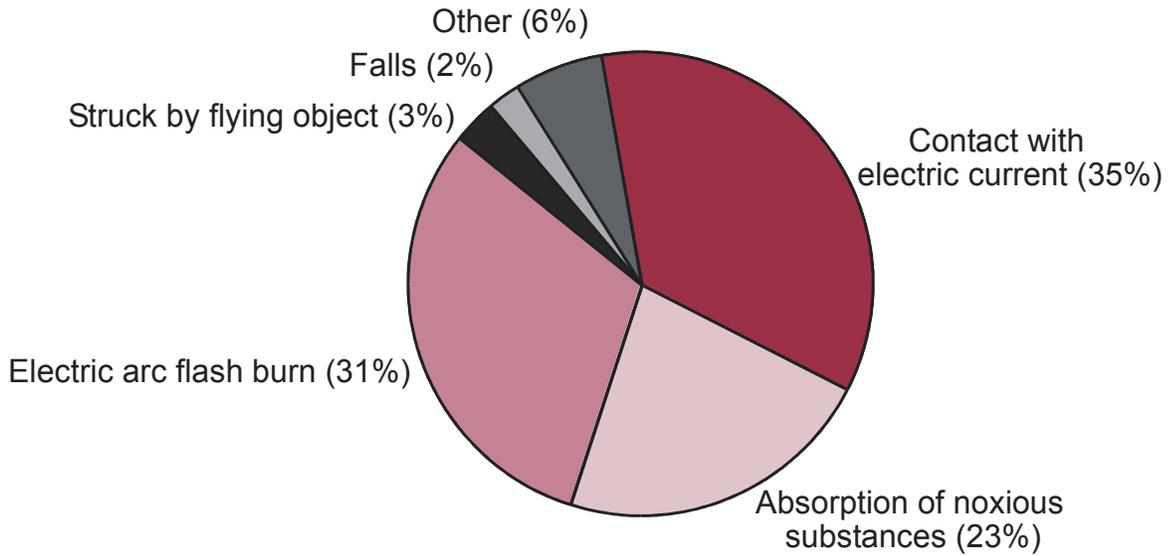


Figure 4C-17.—Nonmetal operators: nonfatal electrical injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 133). (Source: MSHA data)

#### 4D. INJURIES IN STONE MINING

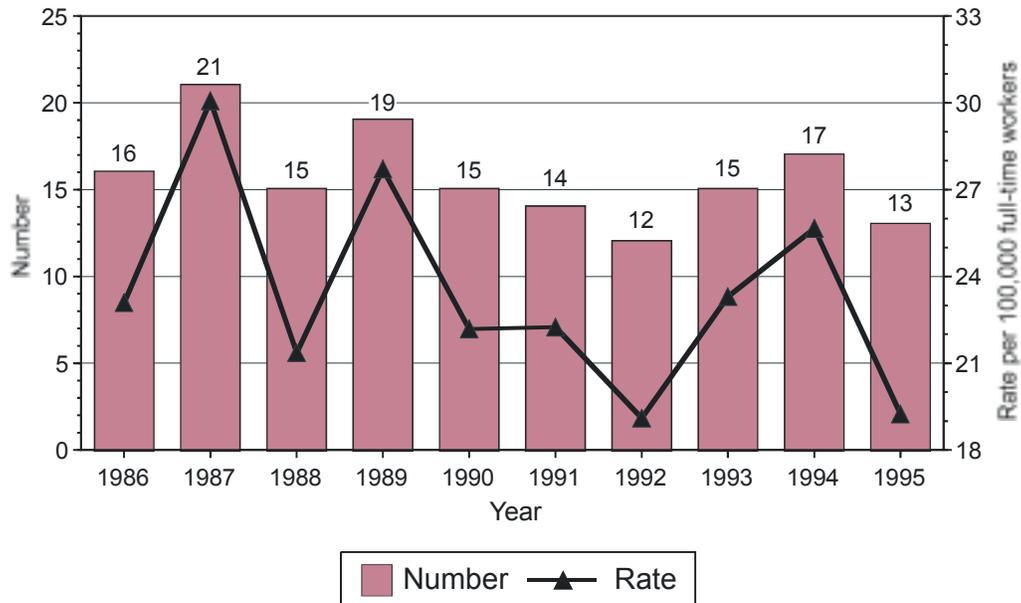


Figure 4D-1.—Stone operators: number and rate (per 100,000 workers) of fatal injuries by year, 1986-1995. (Source: MSHA data)

Table 4D-1.—Stone operators: number and average annual rate (per 100,000 workers) of fatal injuries by subunit, 1986-1995.

<u>Mining operation</u>	<u>Number, 1986-1995</u>	<u>Average annual rate per 100,000 full-time workers</u>
<b>Underground mines:</b>		
Underground operations	12	77.9
Surface operations	5	124.5
<b>Surface mines:</b>		
Strip	99	34.6
Dredge	0	*
<b>Independent shops/yards</b>	0	*
<b>Mill</b>	41	11.4
<b>Office</b>	0	*
<b>Total</b>	<b>157</b>	<b>20.3</b>

\* Rate not calculated because there were fewer than 3 fatalities

Source: Mine Safety and Health Administration data.

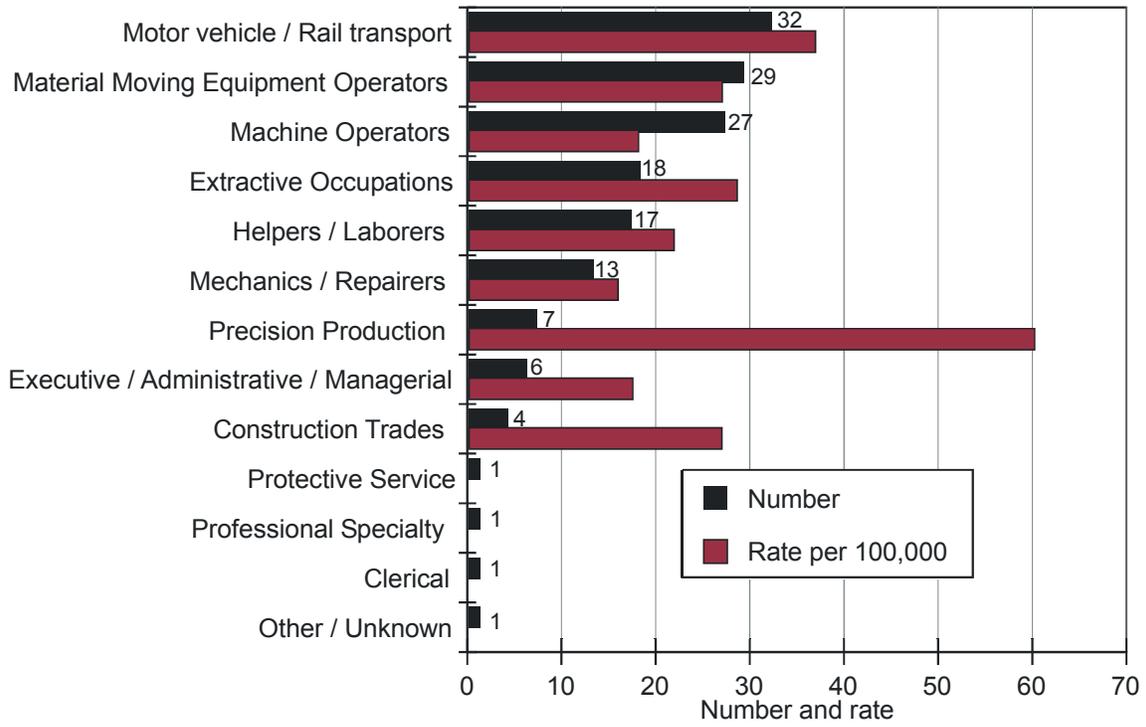


Figure 4D-2.—Stone operators: number and rate (per 100,000 workers) of fatal injuries by U.S. Bureau of the Census Occupation Division, 1986-1995. (Source: MSHA data)

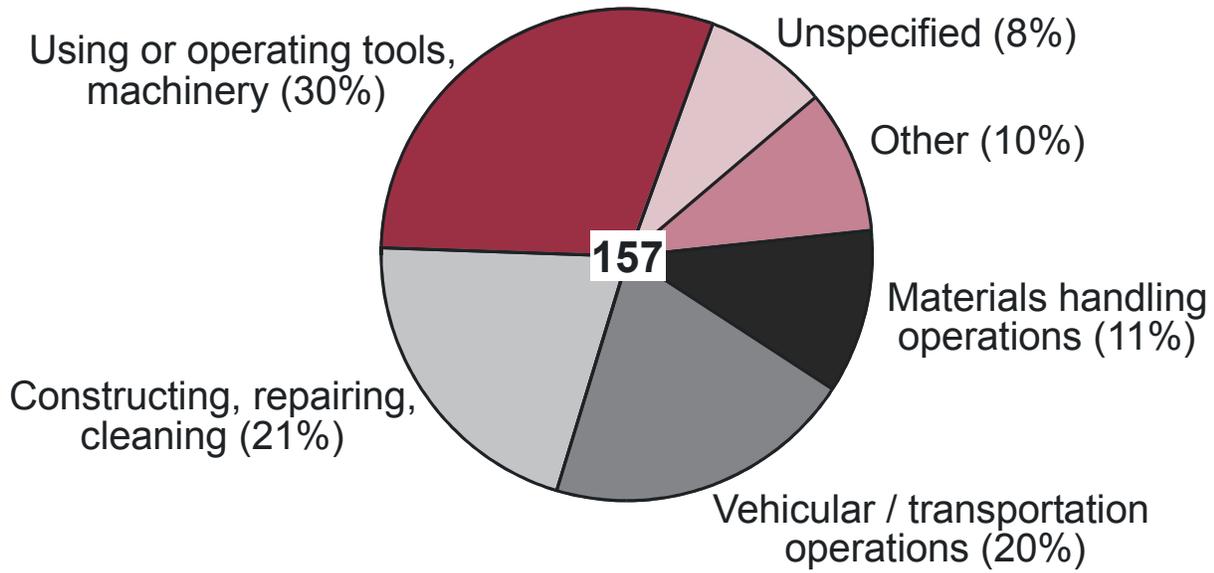


Figure 4D-3.—Stone operators: number of fatal injuries by work activity, 1986-1995. (Source: MSHA data)

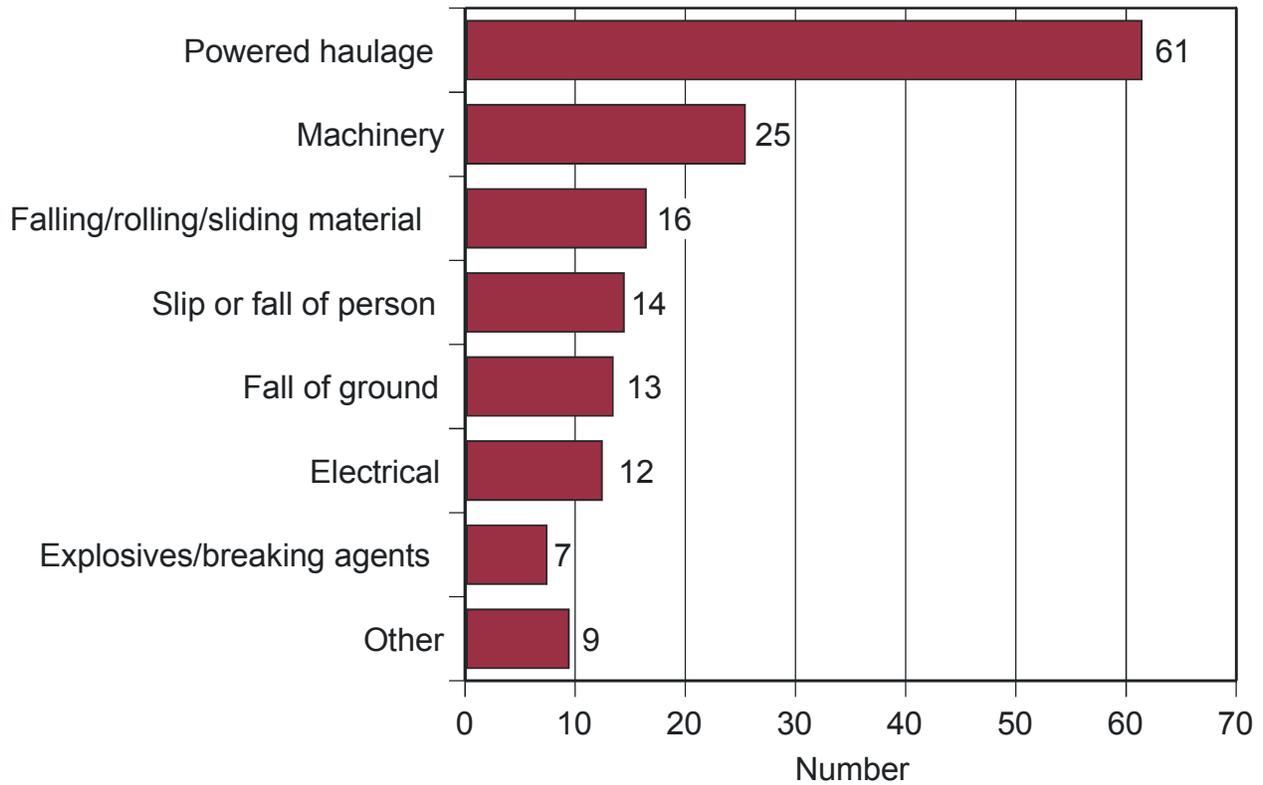


Figure 4D-4.—Stone operators: number of fatal injuries by MSHA accident classification, 1986-1995. (Source: MSHA data)

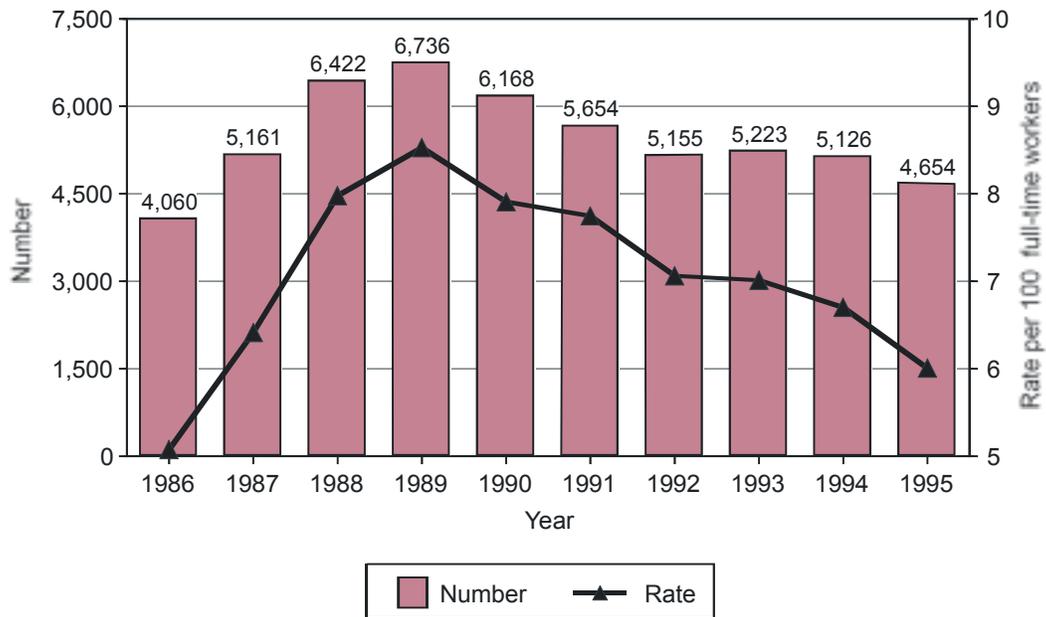


Figure 4D-5.—Stone operators: number and rate (per 100 workers) of nonfatal injuries by year, 1986-1995. (Source: MSHA data)

Table 4D-2.—Stone operators: number and average annual rate (per 100 workers) of nonfatal injuries by subunit, 1986-1995.

<b>Mining operation</b>	<b>Number, 1986-1995</b>	<b>Average annual rate per 100 full-time workers</b>
<b>Underground mines:</b>		
Underground operations	1,173	7.61
Surface operations	450	11.2
<b>Surface mines:</b>		
Strip	21,982	7.68
Dredge	93	6.11
<b>Independent shops/yards</b>	<b>168</b>	<b>7.72</b>
<b>Mill</b>	<b>30,223</b>	<b>8.39</b>
<b>Office</b>	<b>270</b>	<b>0.26</b>
<b>Total</b>	<b>54,359</b>	<b>7.03</b>

Source: Mine Safety and Health Administration data.

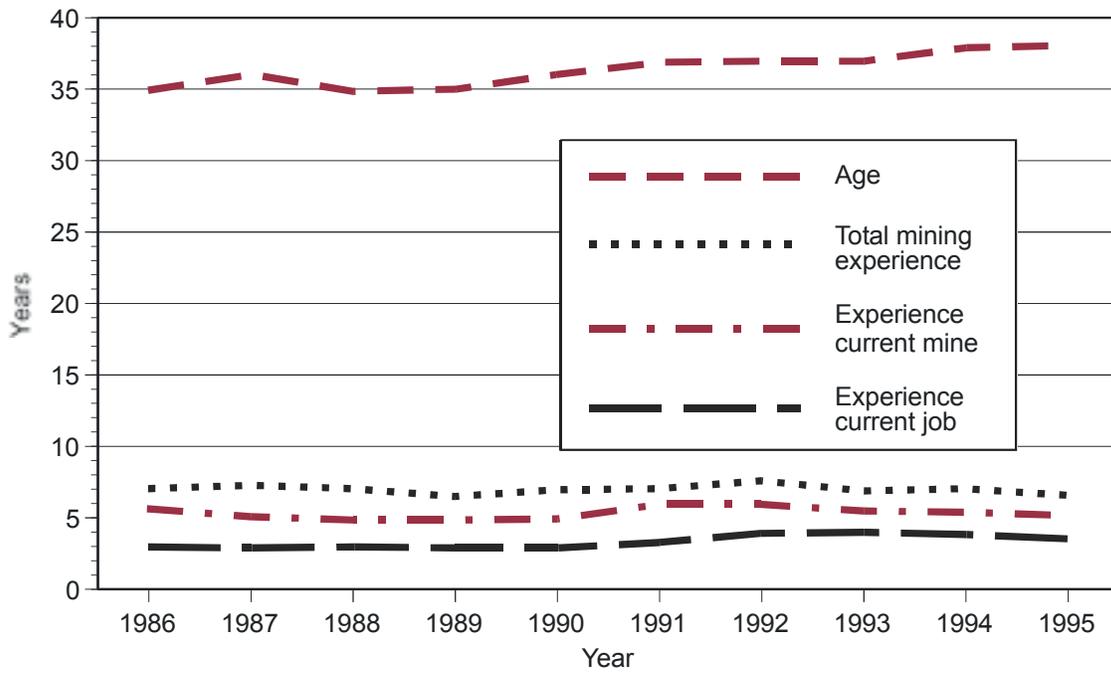


Figure 4D-6.—Stone operators: median values for age, total mining experience, experience in current mine, and experience in current job for workers with nonfatal injuries by year, 1986-1995. (Source: MSHA data)

**Table 4D-3.—Stone operators: nonfatal injuries, 1986-1995, by nature of injury. Number of cases, percentage of cases with one or more lost workdays, mean days lost work per case, total days work lost for all cases, and statutory days charged for all cases.**

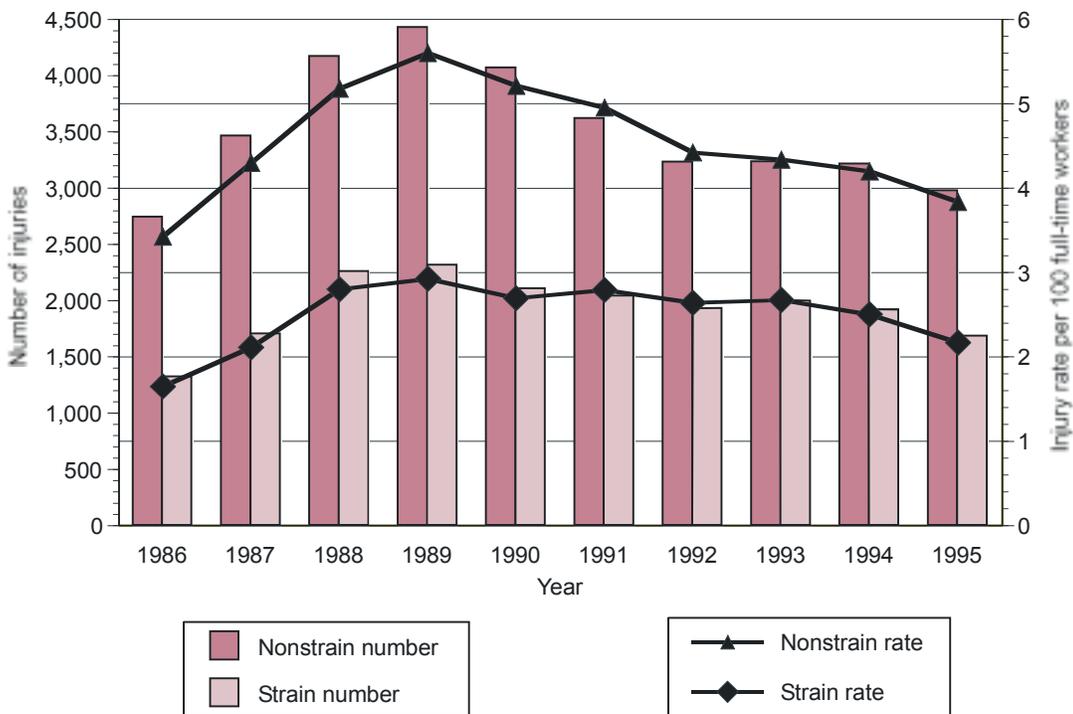
Nature of injury	Number of cases	Lost workday cases (%)	Mean days lost work	Total days lost	Total statutory days
Sprains and strains	17,793	62.0	16.19	288,117	19,890
Fracture	5,080	53.9	23.51	119,430	44,276
Contusions	4,956	51.3	8.09	40,087	1,470
Lacerations	10,552	21.3	2.78	29,257	4,410
Hernia	564	78.2	27.25	15,367	22,050
Burn, heat	1,619	43.2	8.62	13,950	13,500
Amputation, enucleation	326	60.7	30.72	10,016	189,483
Crushing	955	42.0	8.77	8,375	3,950
Dislocation	296	64.2	21.65	6,407	0
Joint, tendon, or muscle inflammation or irritation	418	40.2	9.61	4,015	0
Burn, chemical	1,132	40.2	3.30	3,740	5,400
Noncontact electric arc burn	560	53.2	4.61	2,583	1,800
Abrasions	833	33.9	2.78	2,317	0
Electrical burn	57	61.4	21.79	1,242	0
Dust in eyes	1,616	21.7	0.66	1,073	0
Electric shock	72	63.9	14.22	1,024	0
Poisoning	217	41.5	4.36	946	0
Brain concussion	81	82.7	11.38	922	0
Other specified causes	938	46.6	10.92	10,243	1,800
Multiple injuries, unspecified	3,944	53.6	16.98	66,966	13,650
Other unspecified injuries	2,350	63.0	17.56	41,269	2,820
<b>Total</b>	<b>54,359</b>	<b>48.4</b>	<b>12.28</b>	<b>667,346</b>	<b>324,499</b>

Source: Mine Safety and Health Administration data.

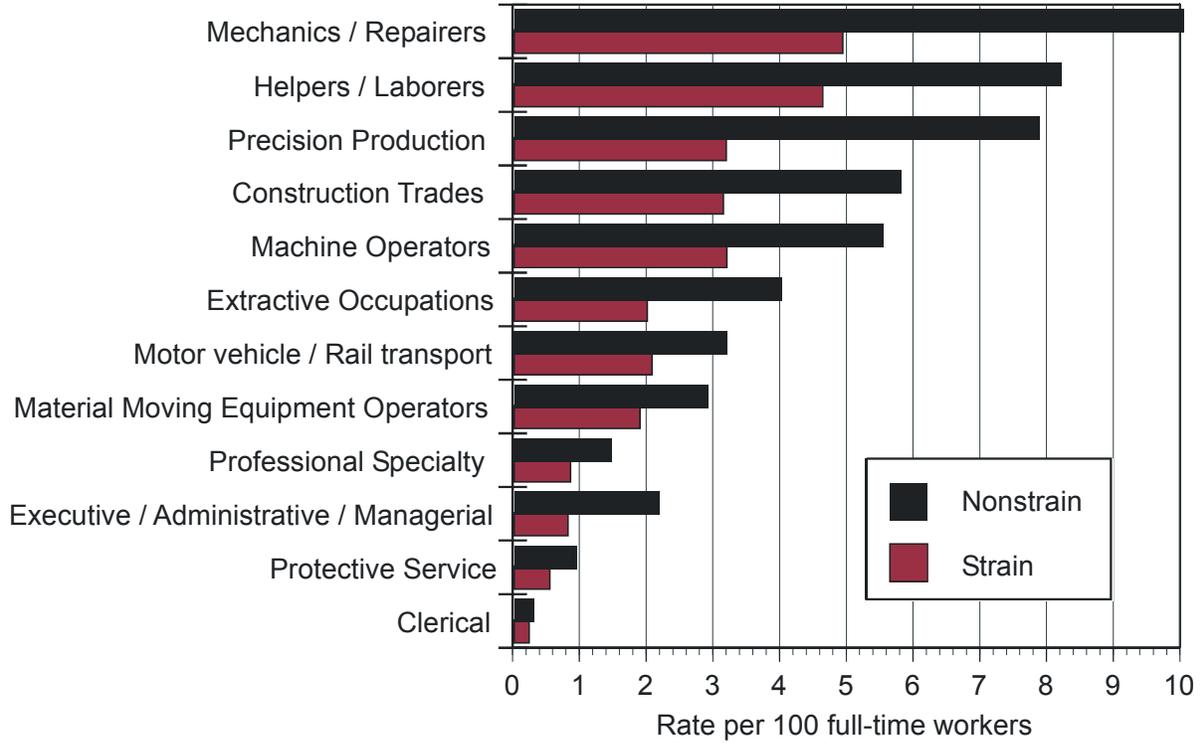
**Table 4D-4.—Stone operators: nonfatal injuries, 1986-1995, by work activity. Number of cases, percentage of cases with one or more lost workdays, mean days lost work per case, total days work lost for all cases, and statutory days charged for all cases.**

Work activity	Number of cases	Lost workday cases (%)	Mean days lost work	Total days lost	Total statutory days
Materials handling	15,502	51.5	12.25	189,919	80,678
Constructing, repairing, or cleaning	11,347	44.1	12.03	136,518	98,815
Using or operating tools or machinery	15,021	39.9	8.75	131,505	81,181
Vehicular and transportation operations	5,876	61.7	17.35	101,949	45,020
Bodily movement	4,983	55.1	14.99	74,695	7,350
Other	1,229	55.8	18.47	22,696	10,605
Unspecified	401	66.6	25.10	10,064	850
<b>Total</b>	<b>54,359</b>	<b>48.4</b>	<b>12.28</b>	<b>667,346</b>	<b>324,499</b>

Source: Mine Safety and Health Administration data.



**Figure 4D-7.—Stone operators: nonfatal injuries 1986-1995. Number and rate (per 100 workers) of strain and nonstrain injuries by year, 1986-1995. (Source: MSHA data)**



**Figure 4D-8.—Stone operators: nonfatal injuries, 1986-1995. Rate (per 100 workers) of strain and nonstrain injuries by U.S. Bureau of the Census Occupation Division, 1986-1995. (Data on occupations were missing for 1,237 out of 54,360 cases (2.3%).) (Source: MSHA data)**

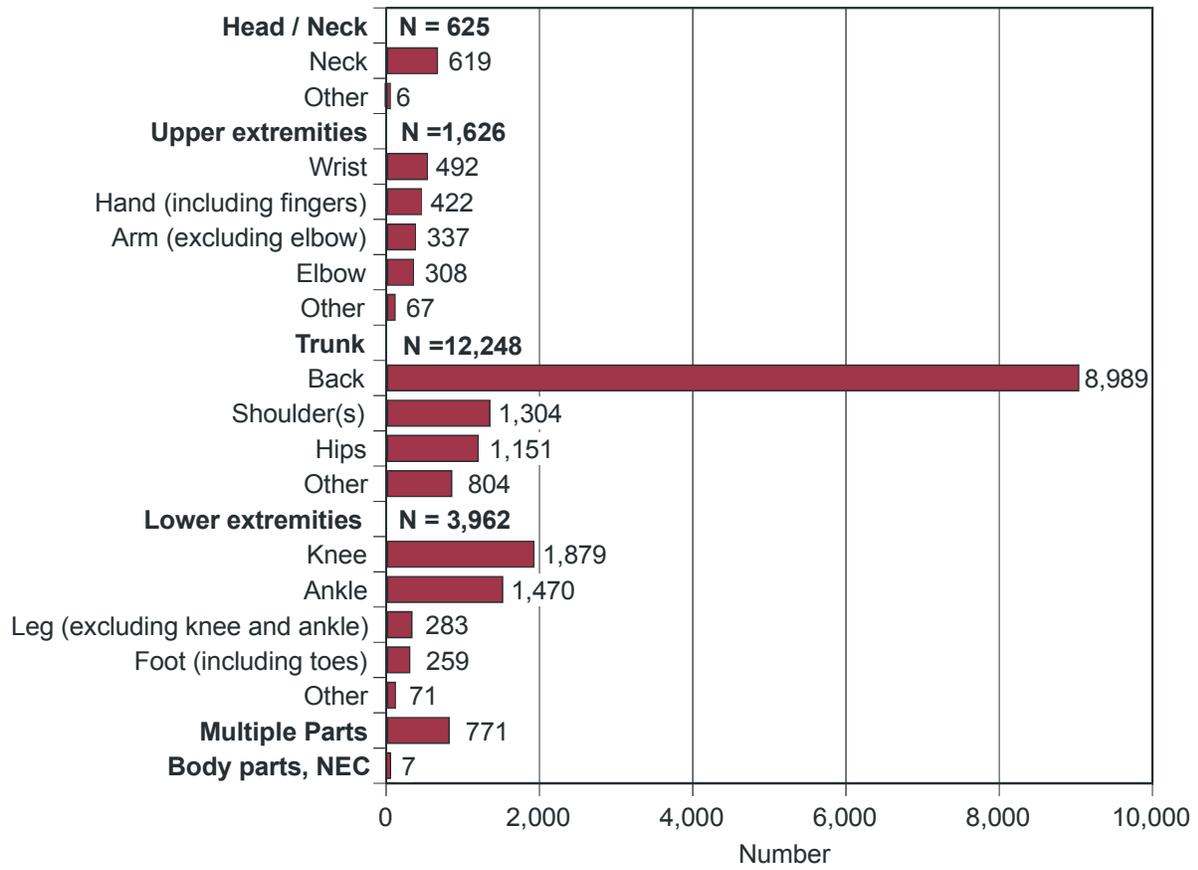


Figure 4D-9.—Stone operators: number of (nonfatal) strain injuries by body part injured, 1986-1995. (Source: MSHA data)

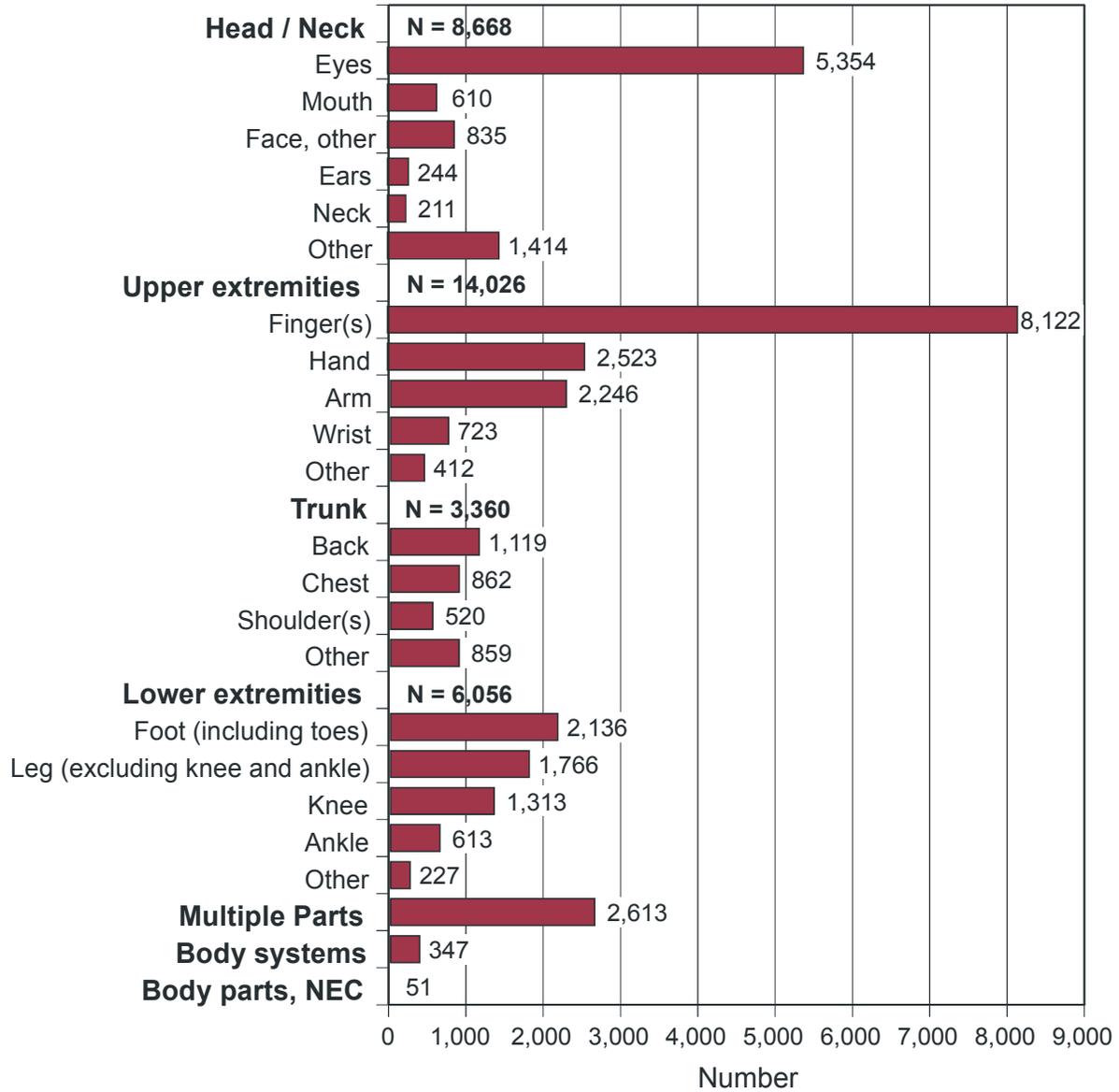


Figure 4D-10.—Stone operators: number of (nonfatal) nonstrain injuries by body part injured, 1986-1995. (Source: MSHA data)

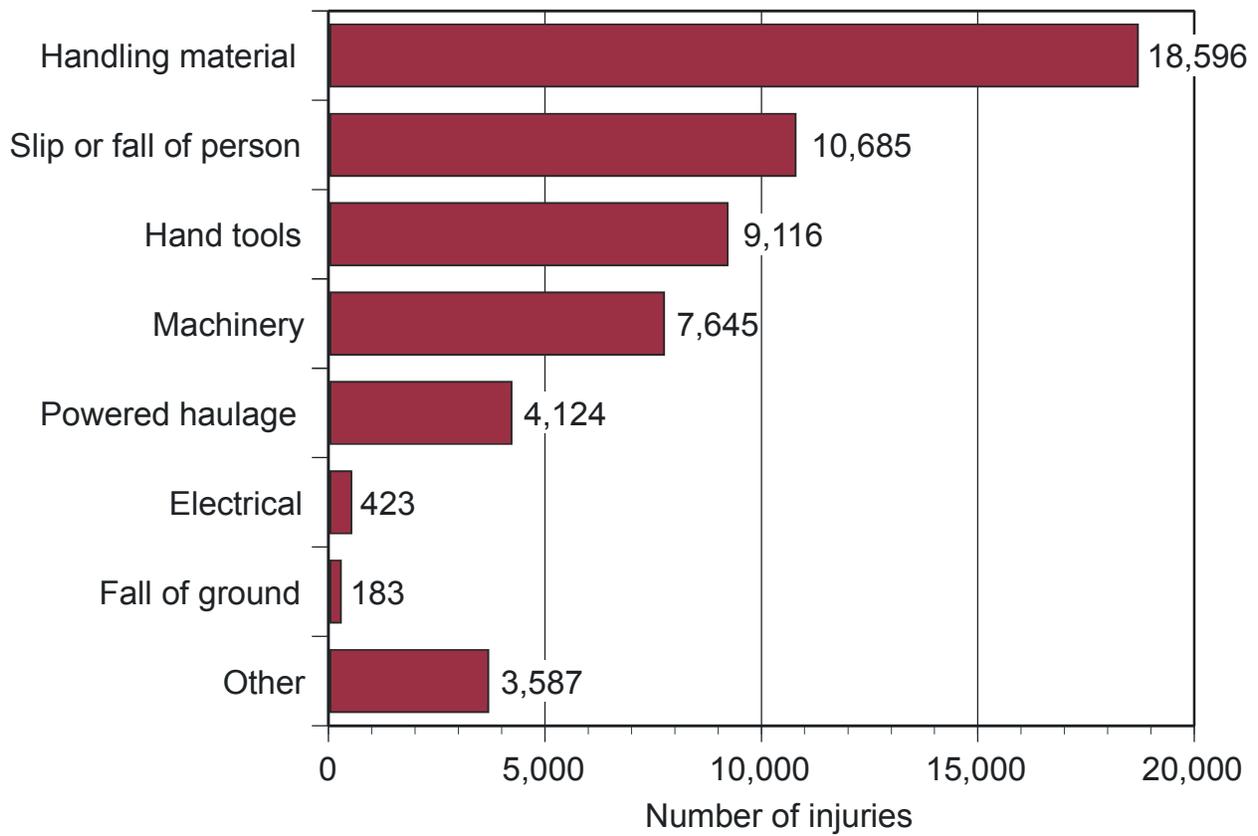


Figure 4D-11.—Stone operators: number of nonfatal injuries by MSHA accident classification, 1986-1995. (Source: MSHA data)

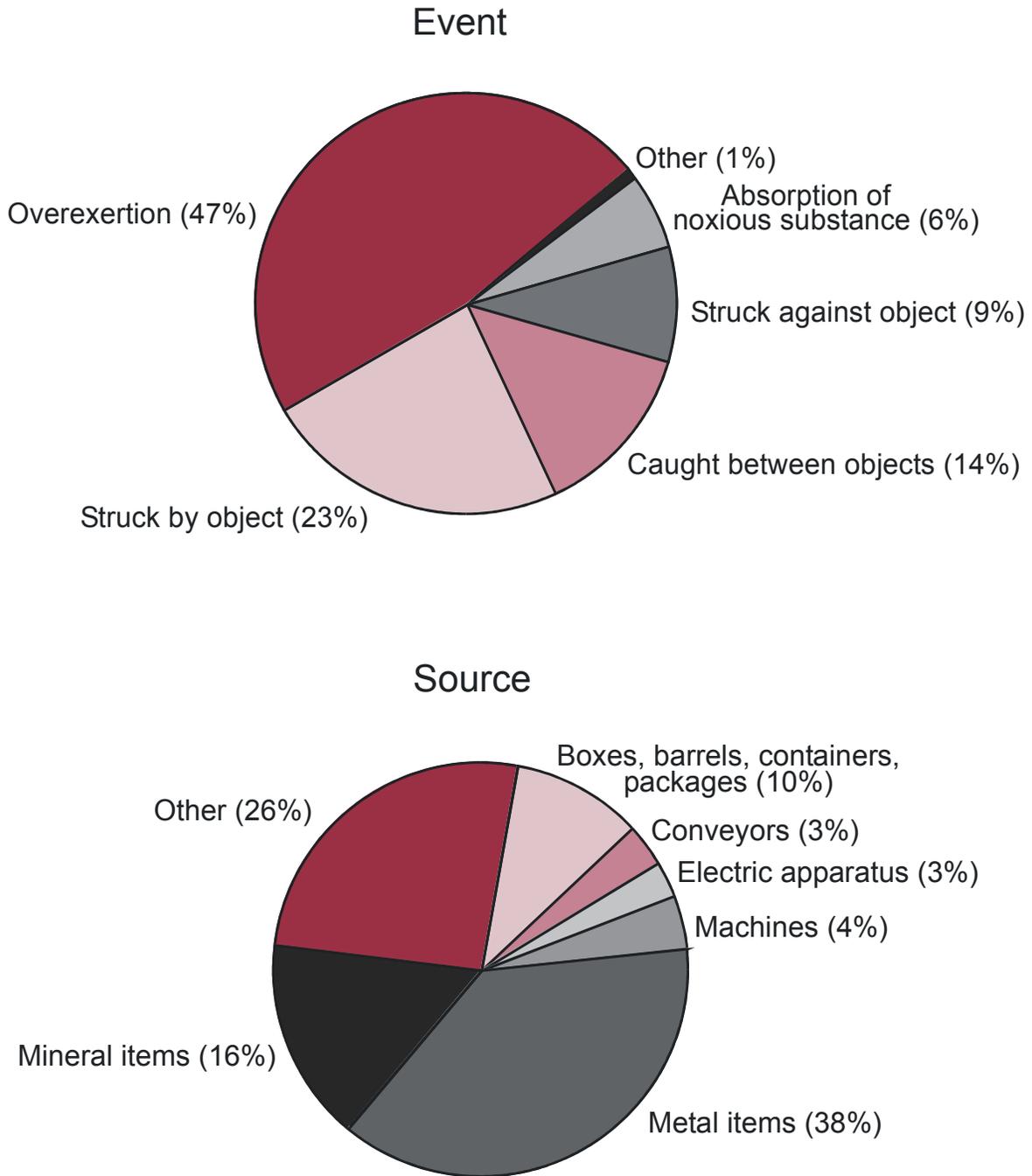


Figure 4D-12.—Stone operators: nonfatal material handling injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 18,596). (Source: MSHA data)

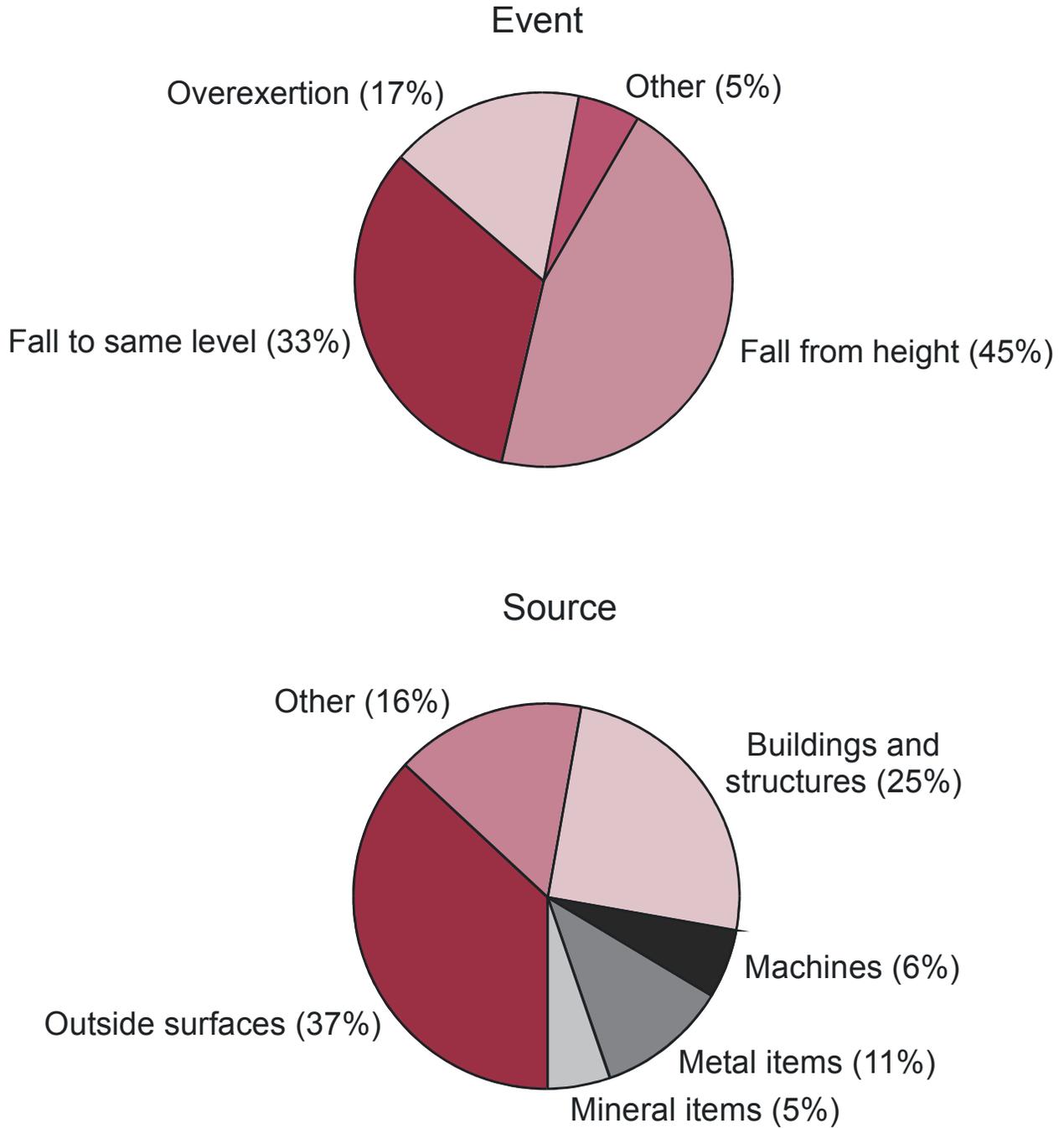


Figure 4D-13.—Stone operators: nonfatal fall injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 10,685). (Source: MSHA data)

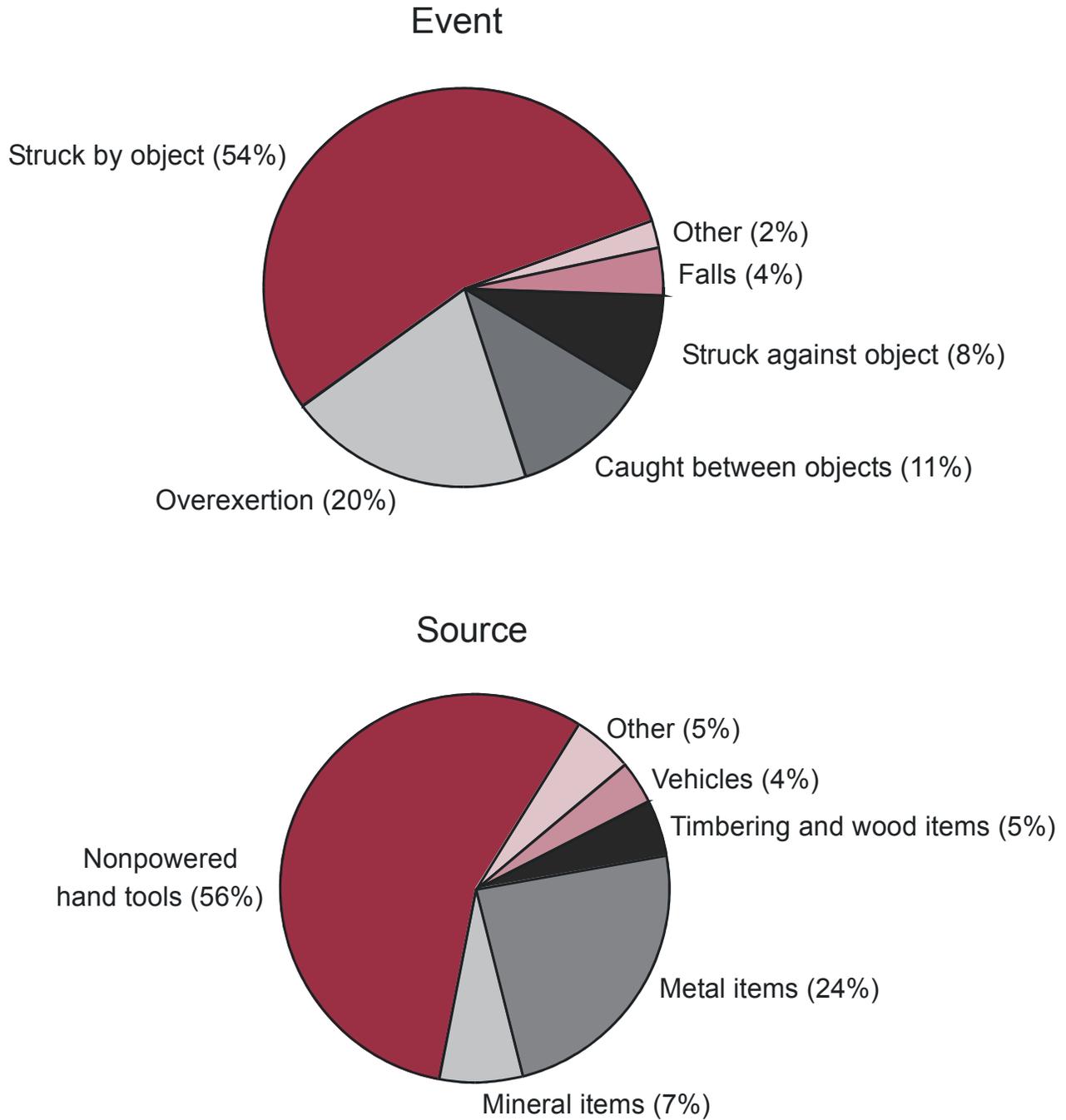
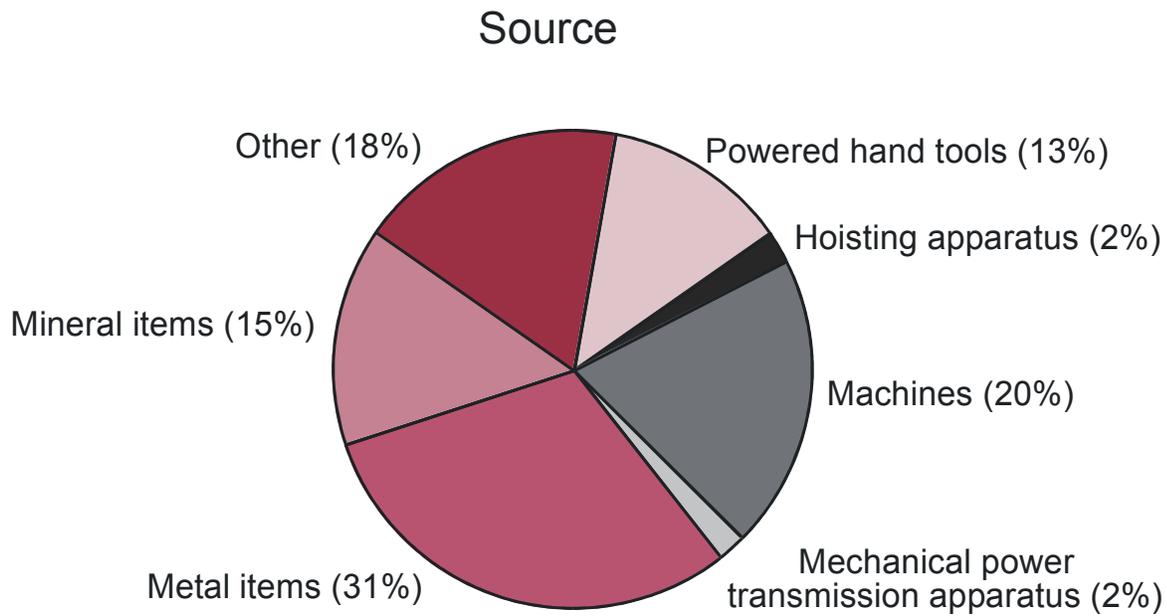
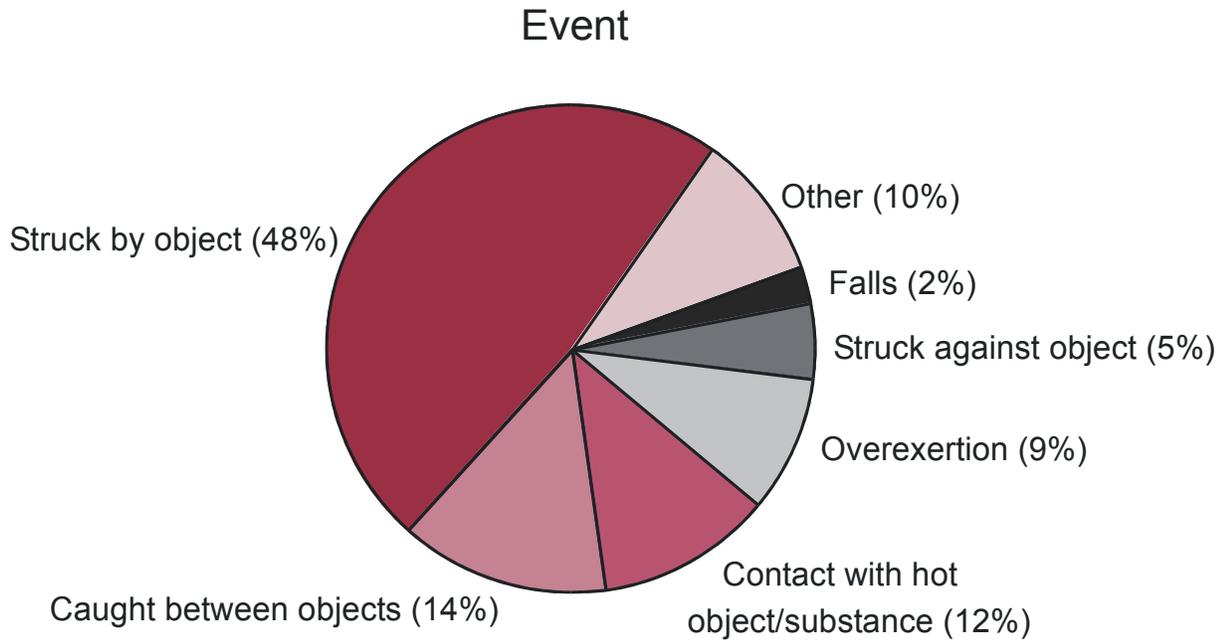
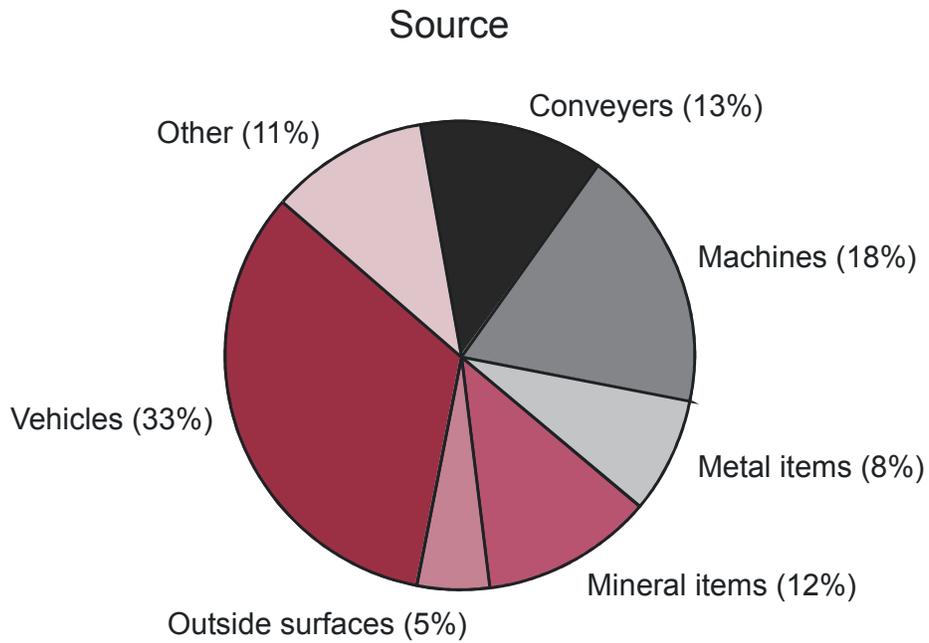
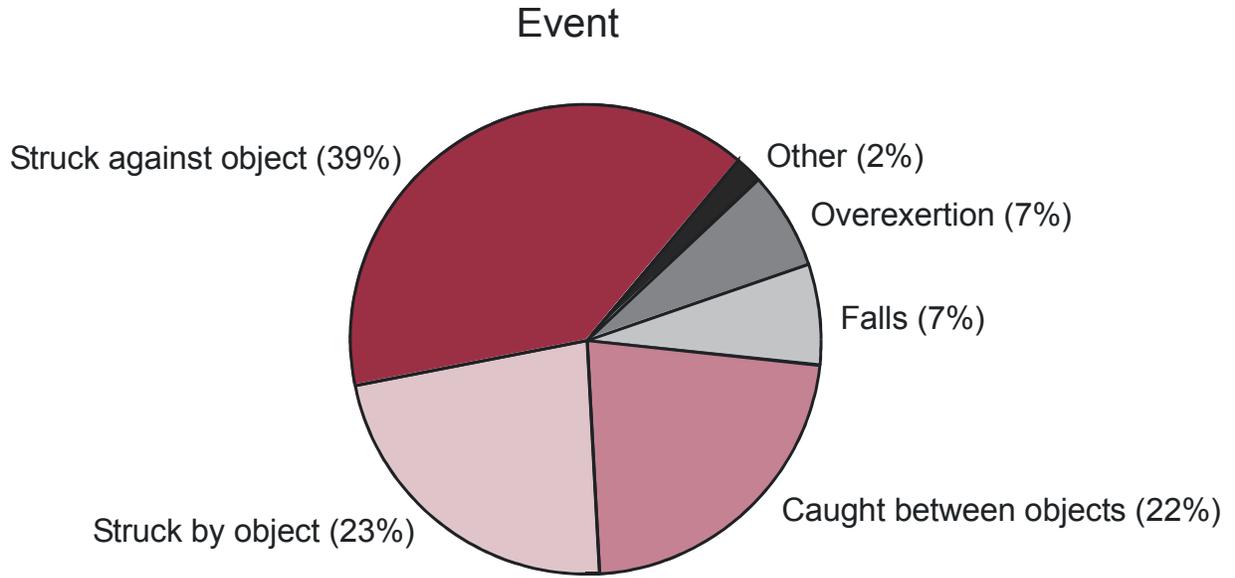


Figure 4D-14.—Stone operators: nonfatal hand tool injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 9, 116). (Source: MSHA data)



**Figure 4D-15.—Stone operators: nonfatal machine injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 7,645). (Source: MSHA data)**



**Figure 4D-16.—Stone operators: nonfatal powered haulage injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 4,124). (Source: MSHA data)**

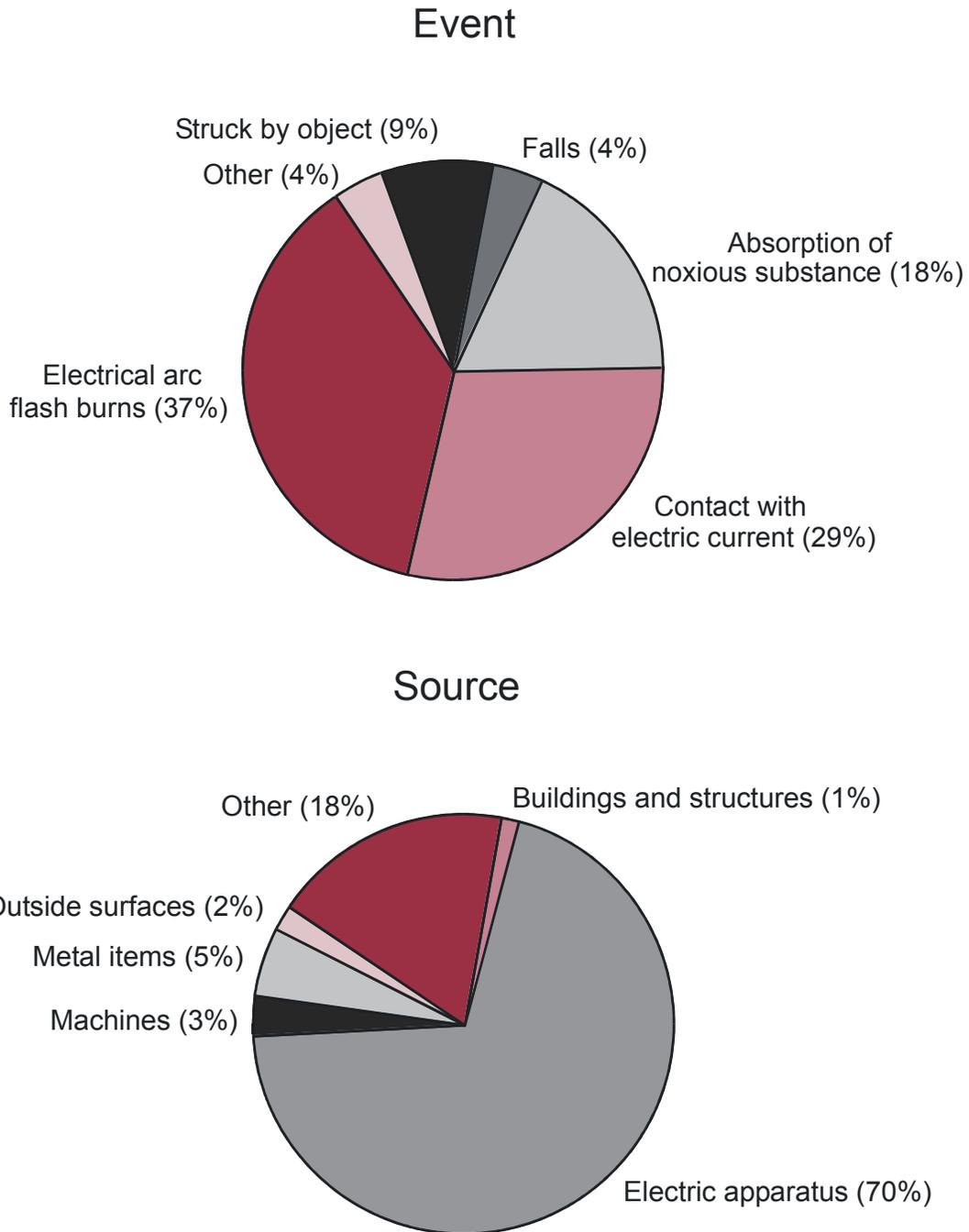


Figure 4D-17.—Stone operators: nonfatal electrical injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 423). (Source: MSHA data)

### 4E. INJURIES IN SAND AND GRAVEL MINING

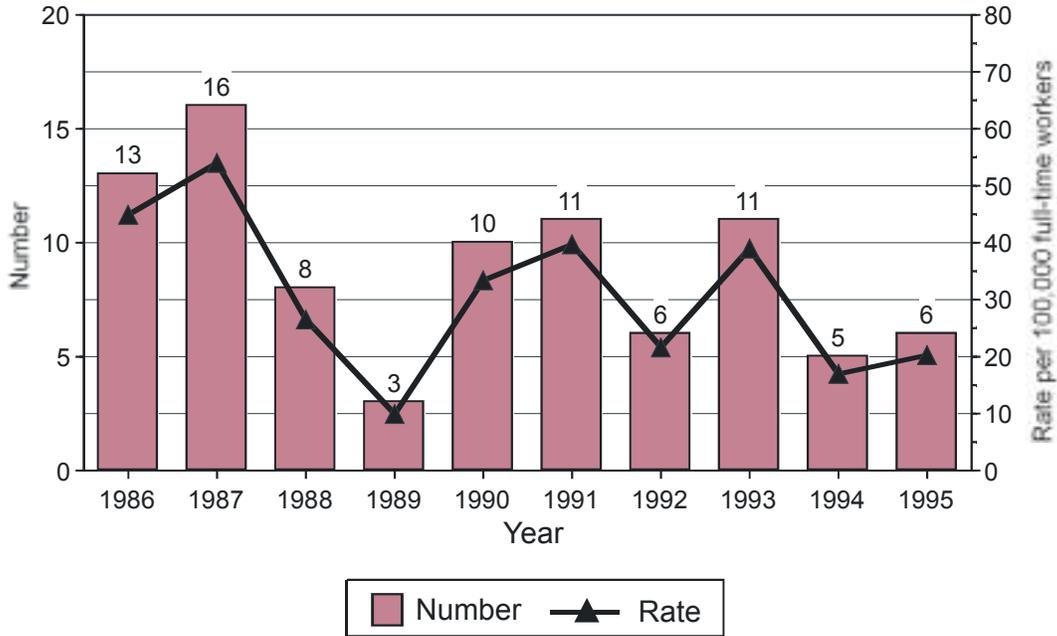


Figure 4E-1.—Sand and gravel operators: number and rate (per 100,000 workers) of fatal injuries by year, 1986-1995. (Source: MSHA data)

Table 4E-1.—Sand and gravel operators: number and average annual rate (per 100,000 workers) of fatal injuries by subunit, 1986-1995.

<u>Mining operation</u>	<u>Number, 1986-1995</u>	<u>Average annual rate per 100,000 full-time workers</u>
<b>Surface mines:</b>		
Strip	67	27.3
Dredge	22	47.3
Office	0	*
<b>Total</b>	<b>89</b>	<b>26.2</b>

\* Rate not calculated because there were fewer than 3 fatalities

Source: Mine Safety and Health Administration data.

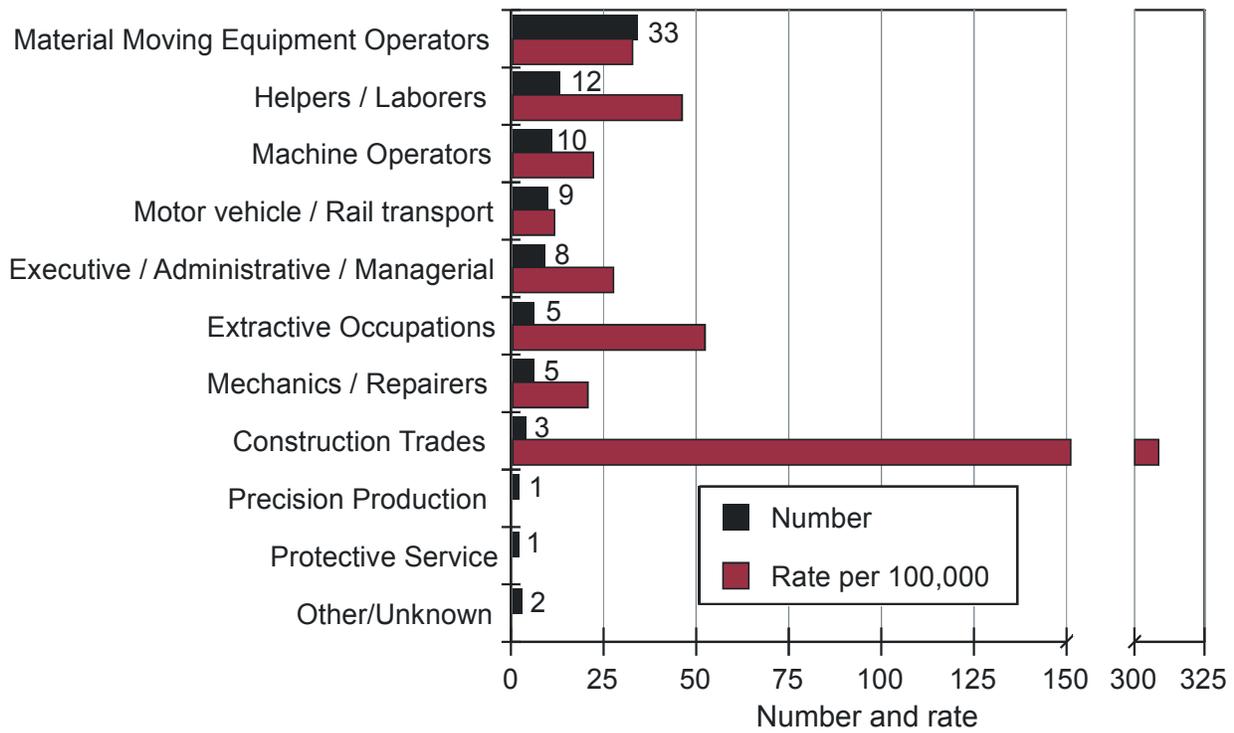


Figure 4E-2.—Sand and gravel operators: number and rate (per 100,000 workers) of fatal injuries by U.S. Bureau of the Census Occupation Division, 1986-1995. (Source: MSHA data)

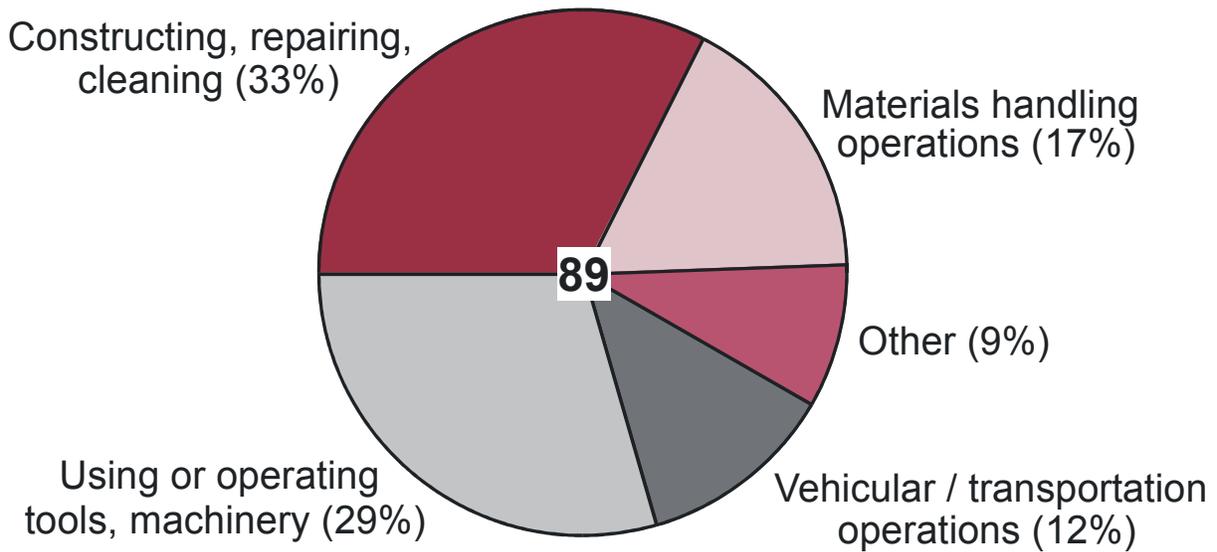


Figure 4E-3.—Sand and gravel operators: number of fatal injuries by work activity, 1986-1995. (Source: MSHA data)

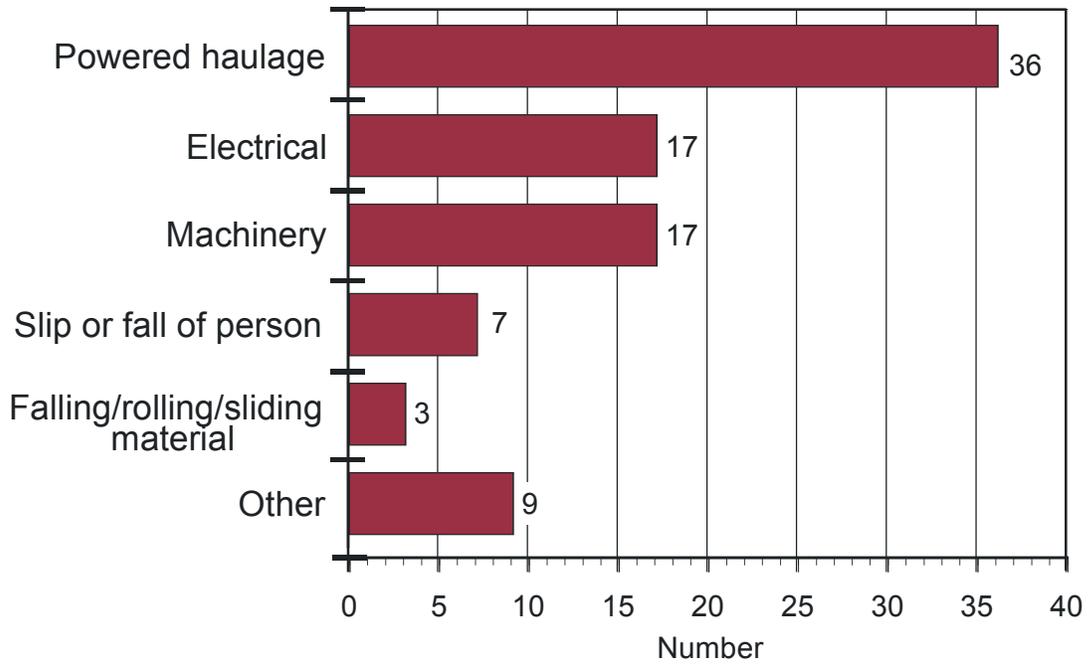


Figure 4E-4.—Sand and gravel operators: number of fatal injuries by MSHA accident classification, 1986-1995. (Source: MSHA data)

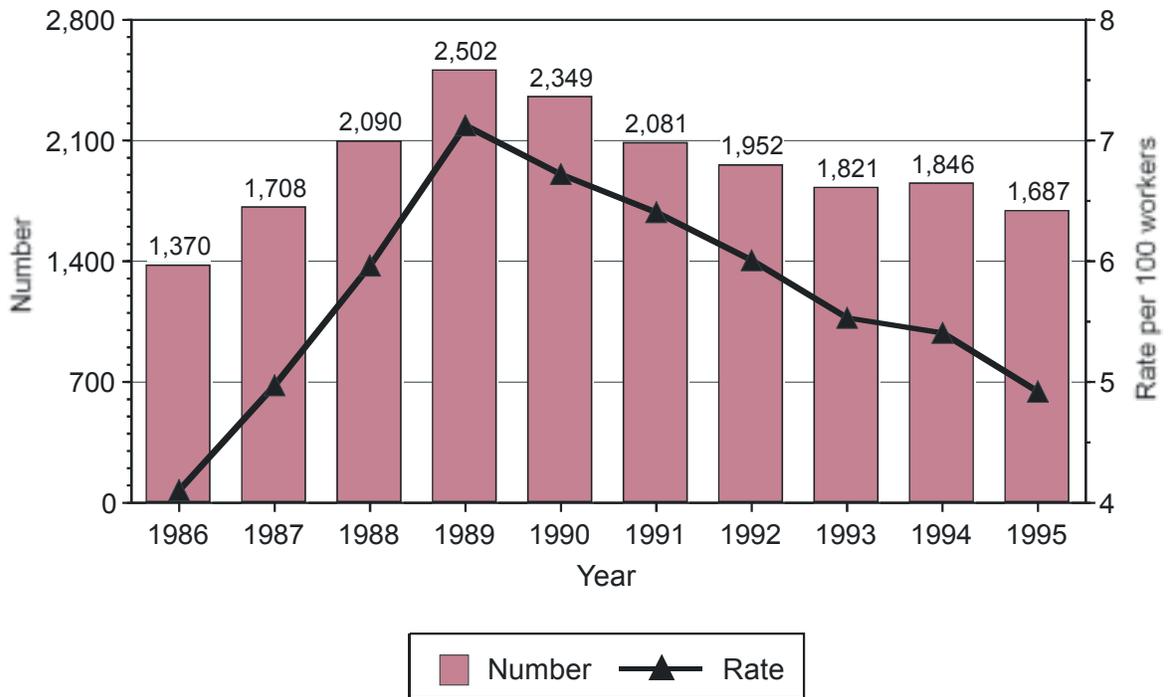
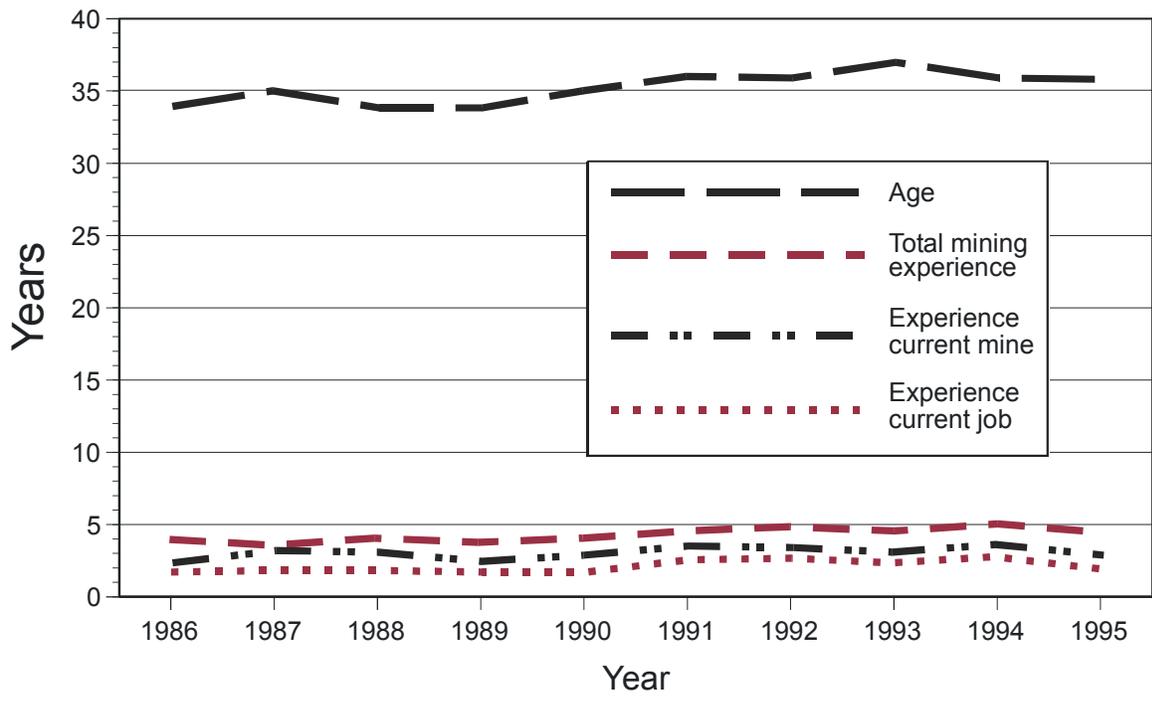


Figure 4E-5.—Sand and gravel operators: number and rate (per 100 workers) of nonfatal injuries by year, 1986-1995. (Source: MSHA data)

**Table 4E-2.—Sand and gravel operators: number and average annual rate (100 workers) of nonfatal injuries by subunit, 1986-1995.**

<u>Mining operation</u>	<u>Number, 1986-1995</u>	<u>Average annual rate per 100 full-time workers</u>
<b>Surface mines:</b>		
Strip	16,045	6.55
Dredge	3,252	6.99
<b>Office</b>	109	0.23
<b>Total</b>	<b>19,406</b>	<b>5.72</b>

Source: Mine Safety and Health Administration data.



**Figure 4E-6.—Sand and gravel operators: median values for age, total mining experience, experience in current mine, and experience in current job for workers with nonfatal injuries by year, 1986-1995. (Source: MSHA data)**

**Table 4E-3.—Sand and gravel operators: nonfatal injuries, 1986-1995, by nature of injury. Number of cases, percentage of cases with one or more lost workdays, mean days lost work per case, total days work lost for all cases, and statutory days charged for all cases.**

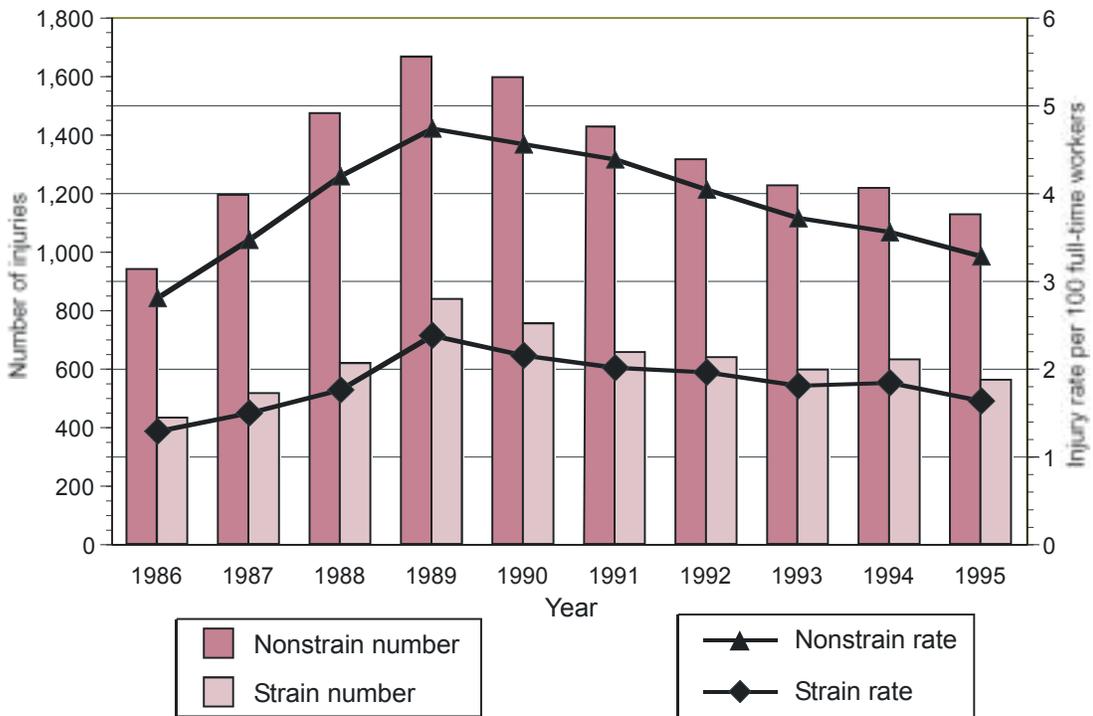
Nature of injury	Number of cases	Lost workday cases (%)	Mean days lost work	Total days lost	Total statutory days
Sprains and strains	5,768	71.2	16.08	92,773	7,920
Fracture	1,793	65.1	24.62	44,138	6,600
Contusions	1,775	59.5	8.53	15,135	1,200
Lacerations	4,111	29.9	3.47	14,269	4,018
Amputation, enucleation	173	59.0	23.85	4,126	154,590
Hernia	183	68.9	20.63	3,776	7,700
Crushing	378	48.4	9.84	3,720	3,270
Burn, heat	492	48.2	5.65	2,780	0
Joint, tendon, or muscle inflammation or irritation	111	55.0	17.66	1,960	0
Dislocation	114	62.3	17.11	1,951	6,000
Electric shock	38	76.3	34.11	1,296	6,000
Noncontact electric arc burn	311	60.8	3.77	1,171	0
Dust in eyes	586	29.9	1.23	723	0
Brain concussion	47	87.2	14.55	684	0
Abrasions	252	42.1	1.95	491	0
Electrical burn	23	69.6	18.70	430	0
Burn, chemical	127	55.1	3.02	383	0
Poisoning	141	40.4	2.15	303	0
Other specified causes	300	58.7	12.65	3,795	5,400
Multiple injuries, unspecified	1,539	67.6	20.83	32,043	22,530
Other unspecified injuries	1,144	65.1	18.08	20,679	5,650
<b>Total</b>	<b>19,406</b>	<b>56.6</b>	<b>12.71</b>	<b>246,626</b>	<b>230,878</b>

Source: Mine Safety and Health Administration data.

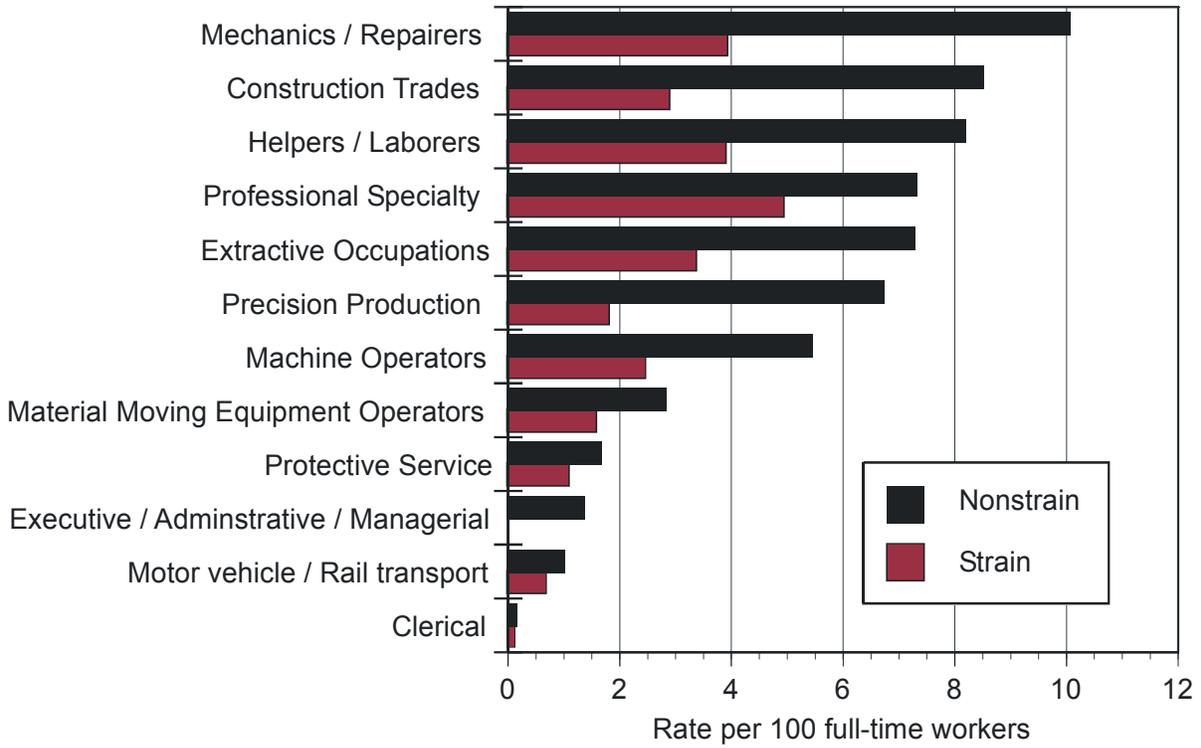
**Table 4E-4.—Sand and gravel operators: nonfatal injuries, 1986-1995, by work activity. Number of cases, percentage of cases with one or more lost workdays, mean days lost work per case, total days work lost for all cases, and statutory days charged for all cases.**

Work activity	Number of cases	Lost workday cases (%)	Mean days lost work	Total days lost	Total statutory days
Materials handling	5,115	60.2	12.51	63,967	52,815
Constructing, repairing, or cleaning	4,518	54.2	13.23	59,754	98,590
Using or operating tools or machinery	5,313	46.6	9.04	48,033	42,000
Vehicular and transportation operations	2,412	68.5	16.91	40,798	18,578
Bodily movement	1,477	65.9	16.42	24,256	8,840
Other	417	61.9	16.43	6,851	9,855
Unspecified	154	59.7	19.27	2,967	200
<b>Total</b>	<b>19,406</b>	<b>56.6</b>	<b>12.71</b>	<b>246,626</b>	<b>230,878</b>

Source: Mine Safety and Health Administration data.



**Figure 4E-7.—Sand and gravel operators: nonfatal injuries 1986-1995. Number and rate (per 100 workers) of strain and nonstrain injuries by year, 1986-1995. (Source: MSHA data)**



**Figure 4E-8.—Sand and gravel operators: nonfatal injuries, 1986-1995. Rate (per 100 workers) of strain and nonstrain injuries by U.S. Bureau of the Census Occupation Division, 1986-1995. (Data on occupations were missing for 610 out of 19,406 cases (3.1%).) (Source: MSHA data)**

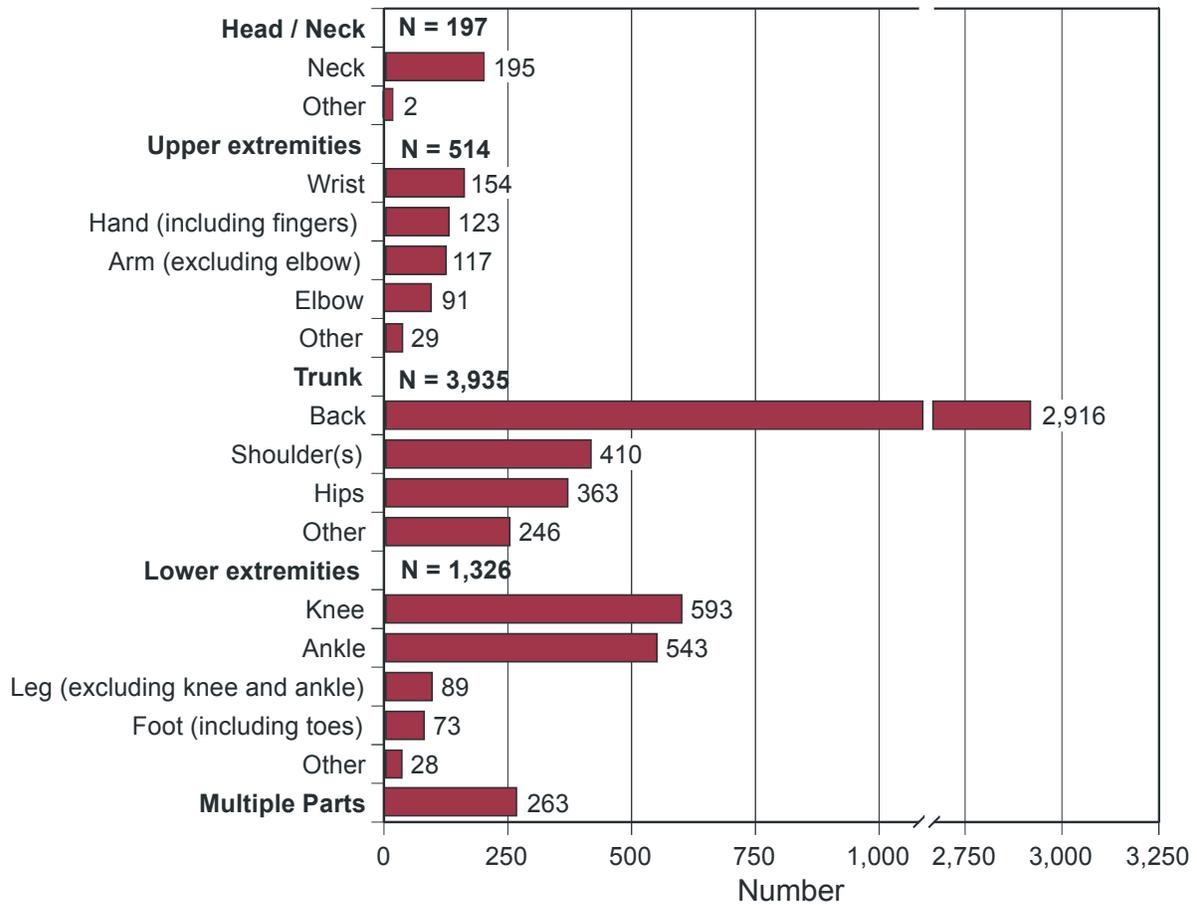


Figure 4E-9.—Sand and gravel operators: number of (nonfatal) strain injuries by body part injured, 1986-1995. (Source: MSHA data)

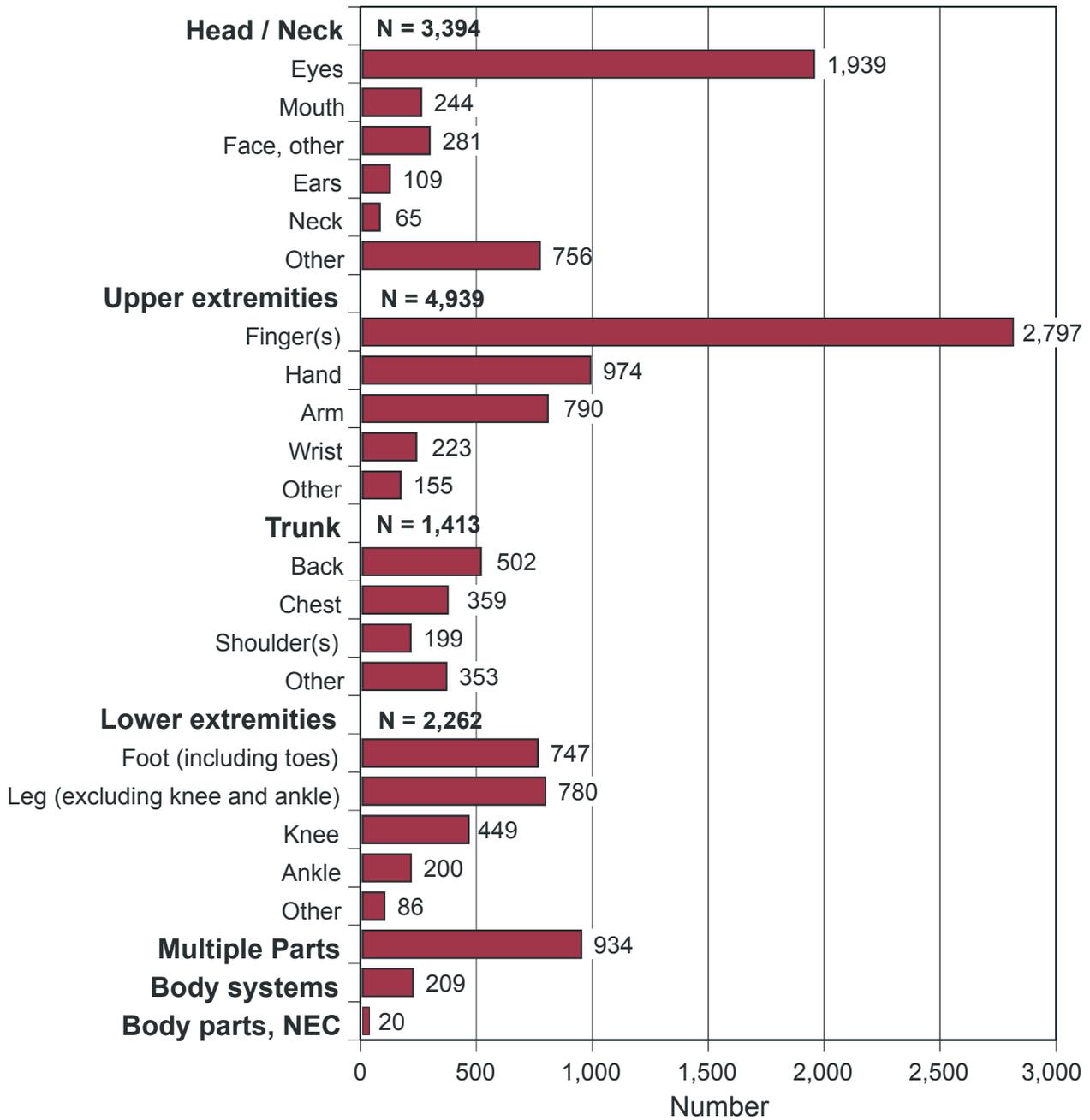


Figure 4E-10.—Sand and gravel operators: number of (nonfatal) nonstrain injuries by body part injured, 1986-1995. (Source: MSHA data)

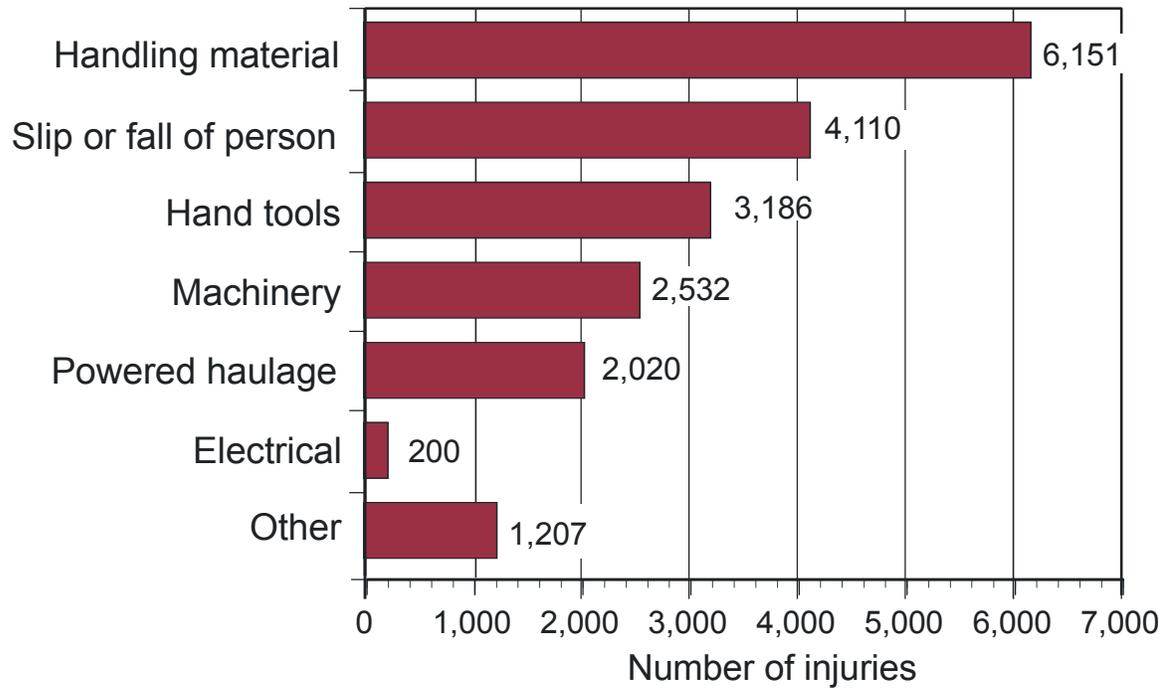


Figure 4E-11.—Sand and gravel operators: number of nonfatal injuries by MSHA accident classification, 1986-1995. (Source: MSHA data)

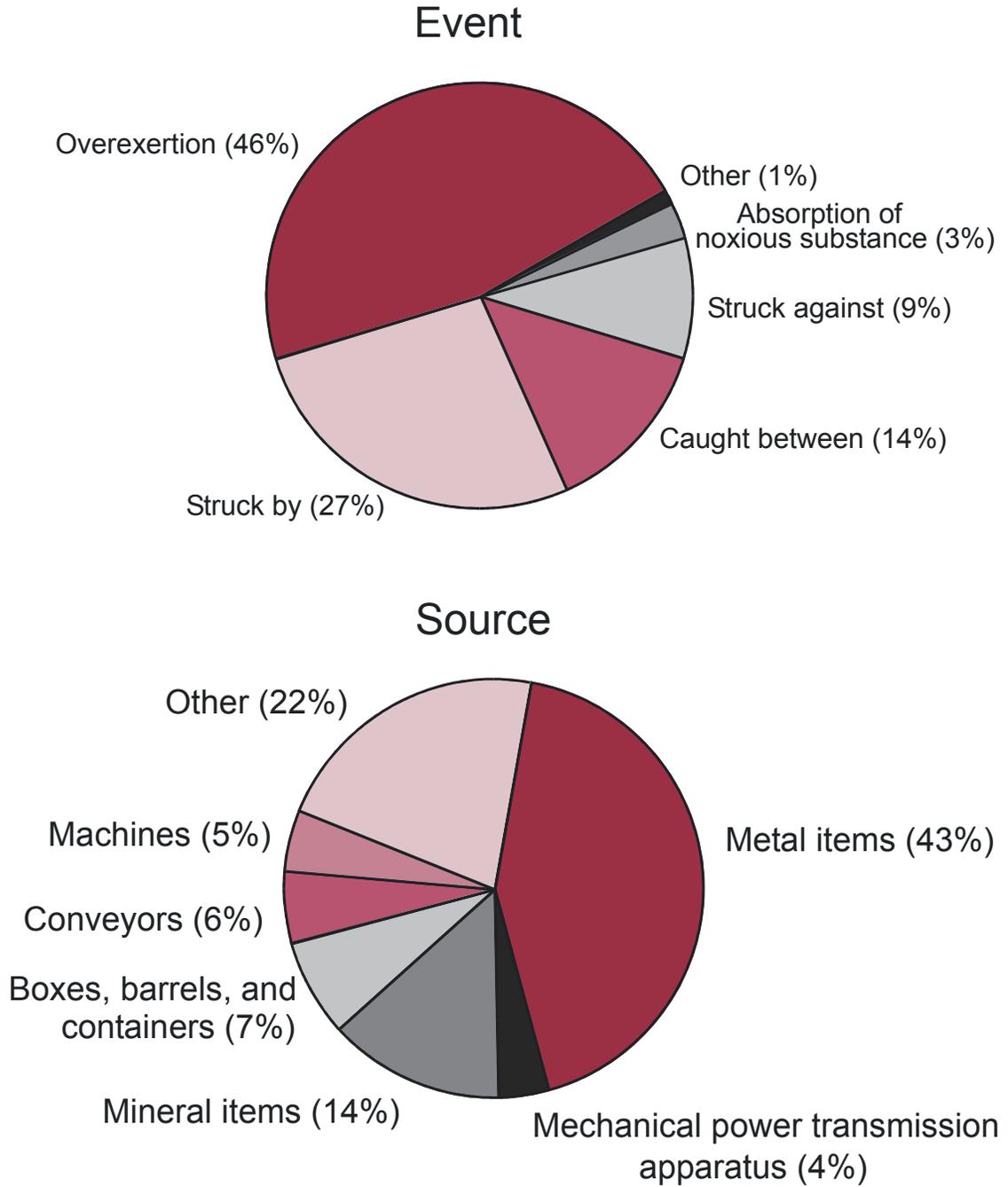


Figure 4E-12.—Sand gravel operators: nonfatal material handling injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 6,151). (Source: MSHA data)

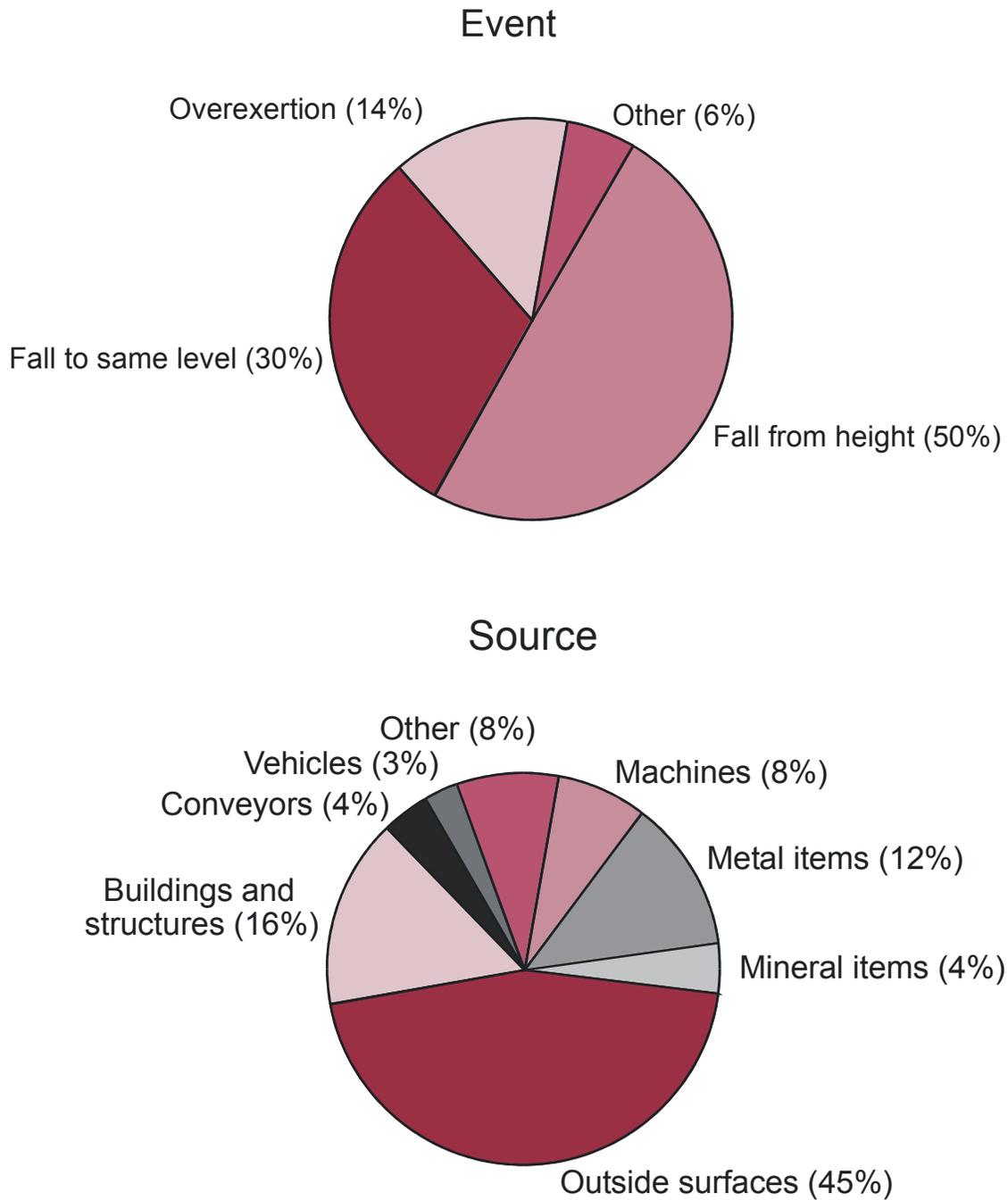


Figure 4E-13.—Sand and gravel operators: nonfatal fall injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 4,110). (Source: MSHA data)

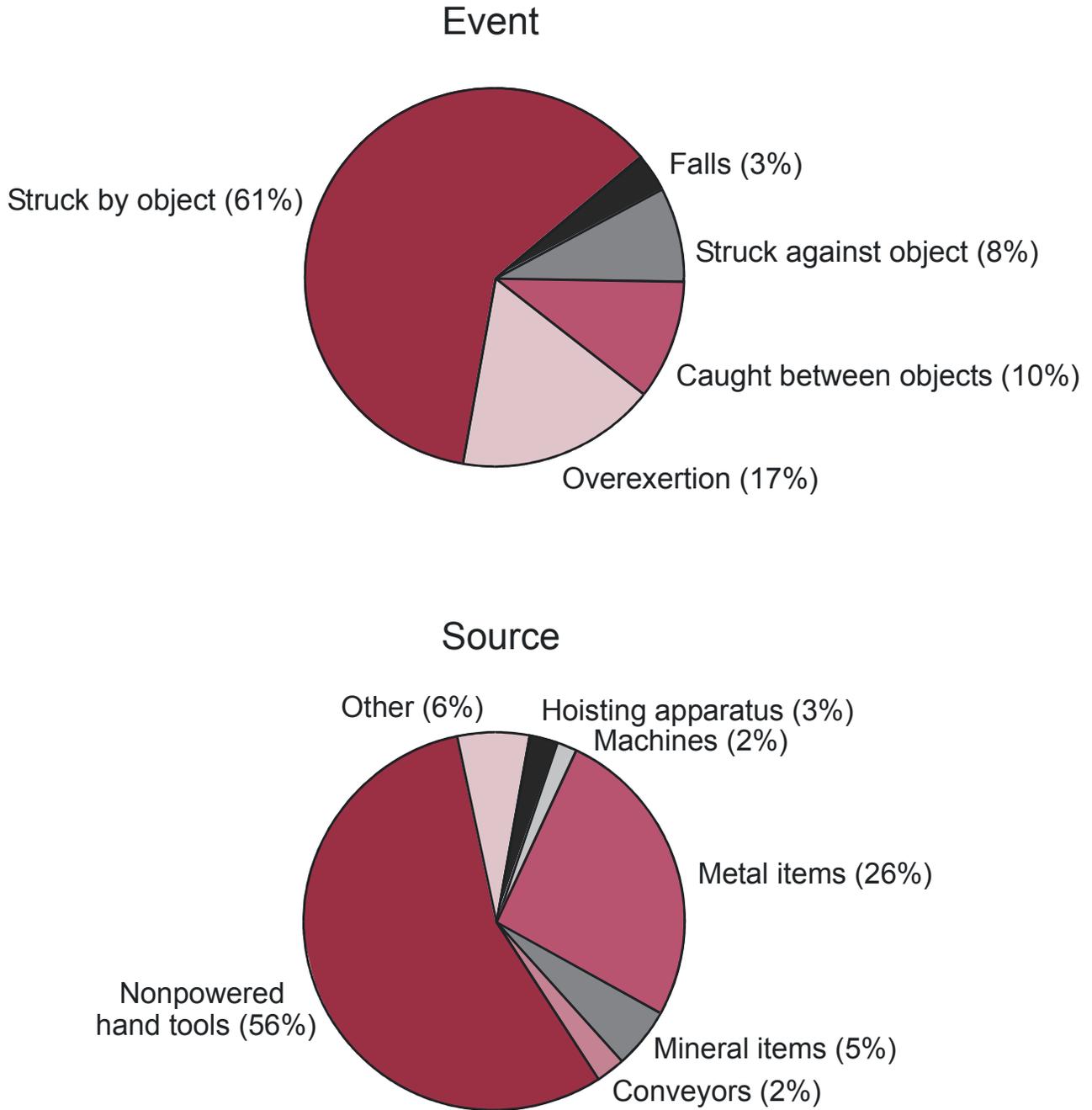
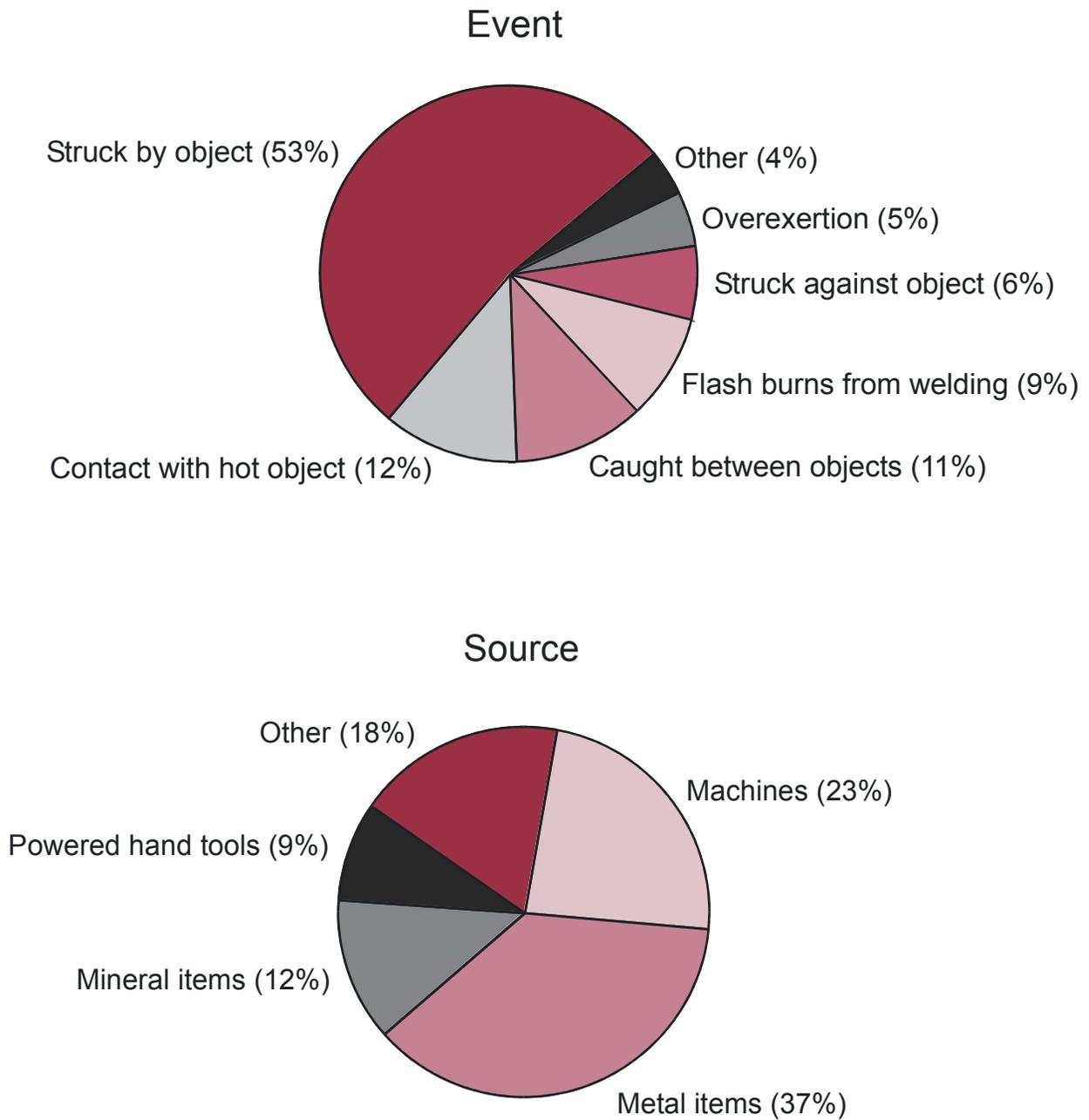


Figure 4E-14.—Sand and gravel operators: nonfatal hand tool injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 3,186). (Source: MSHA data)



**Figure 4E-15.—Sand and gravel operators: nonfatal machine injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 2,532). (Source: MSHA data)**

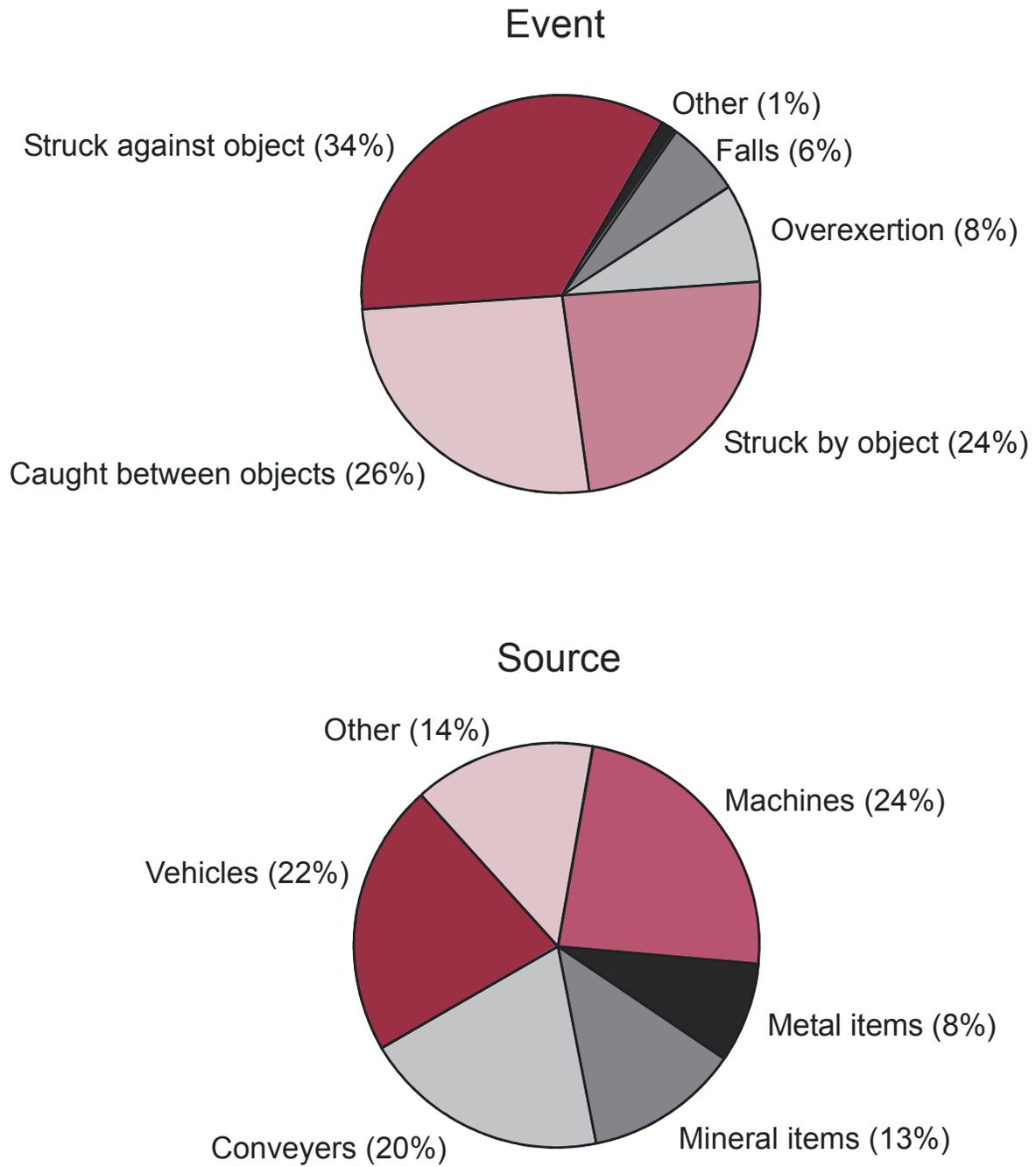


Figure 4E-16.—Sand and gravel operators: nonfatal powered haulage injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 2,020). (Source: MSHA data)

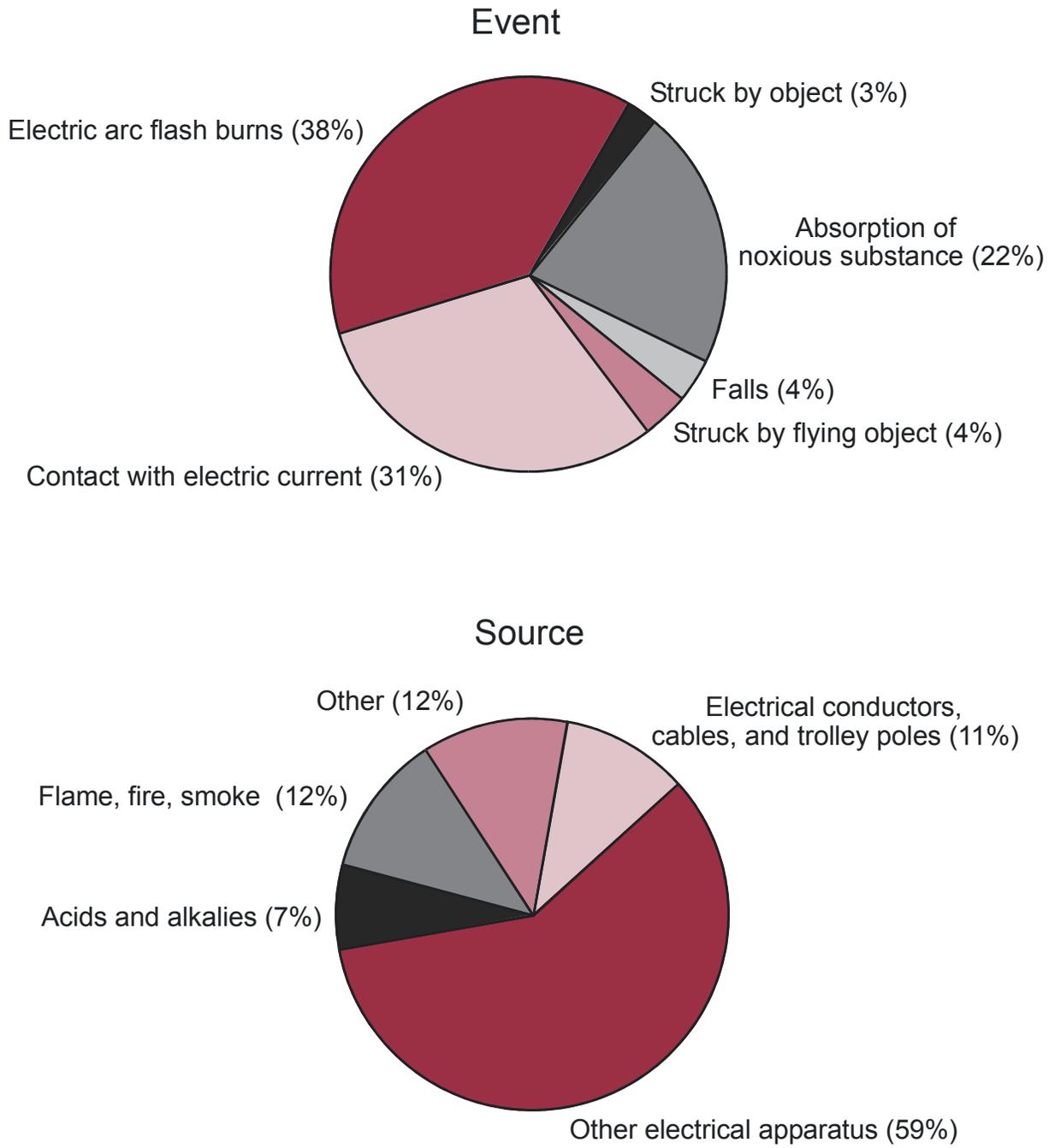


Figure 4E-17.—Sand and gravel operators: nonfatal electrical injuries, 1986-1995. Percent of injuries by event resulting in injury and by source of injury (n = 200). (Source: MSHA data)