THE CENTER TO PROTECT WORKERS' RIGHTS

CPWR

This research was made possible by funding from the Center to Protect Workers' Rights (CPWR) to the George Washington University and, more recently, to the Washington Hospital Center. The funding was part of a CPWR research agreement with the National Institute for Occupational Safety and Health (NIOSH) under NIOSH Cooperative Agreements CCU306169, CCU312014, and CCU317202. The research is solely the responsibility of the authors and does not necessarily represent the official views of NIOSH. CPWR –the research, development, and training arm of the Building and Construction Trades Department, AFL-CIO –is uniquely situated to serve workers, contractors, and the scientific community. CPWR's goal is to improve safety and health in the U.S. construction industry.

Summary

TO LEARN more about the causes of nonfatal injuries affecting construction workers, and in order to identify injury patterns for further investigations and prevention programs, an injury tracking program was established in 1990. The program was motivated, in part, by the high rate of nonfatal injuries in the construction industry and a lack of specific information that describes the causes of these injuries.

Each week from November 1990 through December 1998, a member of the research team reviewed all of the hospital registration forms at the George Washington University (GWU) Emergency Department in Washington, D.C. The demographic and injury information for patients listing a construction occupation was copied onto a standardized form. All personal information was kept confidential.

This report profiles the first seven years of injury tracking, from November 1, 1990 through October 31, 1997. During this period, 2,637 construction workers visited the emergency room a total of 2,916 times. Each injured worker was categorized into one of 16 groups by trade (occupation). The information on demographics, cause of injury, diagnosis, and injured body part was grouped into categories in order to examine injury patterns. Although 279 workers visited the emergency room more than once in the seven years studied, the focus of this report is on each injury case. Thus, this report refers to ‘2,916 injured ‘wotg0-w (p0ured “)194.1(w0na5e(fe)-6.5(rtrodtioo-17

Contents

Background and Methods

CONSTRUCTION is a dangerous industry, with high rates of fatal and nonfatal injuries. In order to learn more about the causes of nonfatal injuries affecting construction workers and to identify injury trends for further investigations and prevention programs, an emergency department-based injury tracking program was established in 1990. The program was motivated, in part, by the high rate of nonfatal injuries in the construction industry and a lack of specific information about the causes of the injuries. This report profiles construction workers' injuries that were identified on hospital registration forms at the George Washington University Emergency Department in Washington, D.C., from November 1, 1990 through October 31, 1997.

Each week, a member of the research team reviewed all of the hospital registration forms to identify injured workers in all construction occupations. Included was any worker whose job title was coded by the 1980 Standard Occupational Code (U.S. Department of Commerce) as "construction trades," "construction laborers," "construction helpers," "construction managers," "construction supervisors," "construction inspectors," "sheetmetal workers," or "elevator installers and repairers." Thus, the list included construction tradespeople employed by non-construction-industry employers, such as maintenance painters, carpenters, electricians, and plumbers employed primarily by government agencies, educational institutions, and museums or theaters. Finally, some other job titles, such as, "welders" and "material moving equipment operators," were included if they appeared (from the employer name) to be engaged in construction work (table 1).

Table 1. Standard Occupational Classification (SOC) criteria for including and grouping job titles

SOC code	SOC category description	Trade group for analysis
121	General managers and top executives	Supervisors
133	* Construction managers note a]	Supervisors
1472	* Construction inspectors	Supervisors
161	Architects	Supervisors
162-3	Engineers	Supervisors
616	Heating, air conditioning, and refrigeration mechanics	Sheet Metal Workers
6176	* Elevator installers and repairers	Elevator Constructors & Mechanics
6179	Mechanics and repairers, NEC (only sprinkler fitters)	Plumbers & Sprinkler Fitters
631x	* Supervisors, construction	Supervisors
641x	* Brick masons, stone masons, and hard tile setters	Brick, Stone, & Concrete Masons
6422	* Carpenters [note b]	Carpenters & Carpet Layers OR Exhibit Technicians
6424	* Drywall installers	Drywall & Plaster Workers
6432	* Electricians	Electricians
6433	* Electrical power installers and repairers	Electricians

Injuries were determined to be work-related based on a combination of data in the medical record: the patient's initial complaint, indication that the payment was to be through workers' compensation insurance, notes made by any treating health care worker about the circumstances of the injury, or the physician's check in a box labeled "work-related."

During the seven years of data collection reported here, 2,916 visits to the Emergency Department were made by 2,637 injured

records, and employer injury logs (the BLS website; Culver, Marshall, and Connolly 1992; and Brown and Connolly 1992). profiles construction injuries using these and other sources (CPWR 2002).

In this report, injuries have been grouped by their causes into one of 10 general categories such as "falls," "struck by object," and "machinery related." These cause of injury categories are based on "E-codes" that are part of the International Classification of Diseases and are commonly used to describe injuries and diseases in medical settings such as emergency departments. More-detailed categories are also used for grouping injuries by cause, diagnosis, and injured body part. The reader should be aware that other coding systems exist. For example, the Bureau of Labor Statistics has its own system. When interpreting the results of a study, it is important to know which coding system was used.

Although many previous reports have described construction worker injuries, very few have provided detailed data by trade. An important exception is a 1995 injury atlas from the Construction Safety Association of Ontario, Canada, which described lost-time construction injuries for each trade in detail. The atlas has been updated; see **www.csao.org**. This chart book has in many ways been modeled on the Ontario report; our hope is that it will be as valuable for establishing trade-specific prevention priorities.

Nessel-Stephens, Lisa, Laura S Welch, James S Weeks, Katherine L Hunting, and Jose Cardenas-Amaya. 1995. Carbon Monoxide

Injury Profiles for All Construction Workers

IN SEVEN YEARS, information was collected on a total of 2,916 visits by construction workers to the emergency department for work-related injuries. Two hundred and seventy-nine of the visits were made by workers who were treated more than once on different occasions for different injuries. In this report, each hospital visit is counted as a separate injury case and, for simplicity, the total set of cases is referred to as '2,916 injured workers."An overview of the injuries and injured is presented in charts 1-A through 1-Q.

Demographic characteristics (charts 1-A through 1-C): The injured workers were generally young; two of every three workers were under the age of 40. Just over half of the injured workers were members of ethnic minorities. The hospital categorized each worker as Hispanic (which includes black and white), non-Hispanic black, and non-Hispanic white. Only 3% of the injured workers were female. For statistical analysis, construction workers who didn't specify a trade were grouped with laborers, with the result making up the largest group –29% of injured workers. Some trades that pe rform similar work were grouped together for analysis. For instance, maintenance carpenters, electricians, plumbers, and painters were grouped with their construction counterparts. Exhibit technicians were assigned to their own group because their tasks were considered to be unique.

Causes of injury (charts 1-D and 1-E): The leading cause of injury was contact with cutting or piercing objects –most often pieces of metal, razors and knives, power tools, and nails.

Injury diagnoses and body parts (charts 1-F through 1-H): About 10% of the workers had two injury diagnoses, sometimes to different parts of the body; for instance, a worker might have been treated for a bruised arm and a strained shoulder following a fall. Because of this, some workers are counted in more than one category and the percentages add to more than 100.

About one in three workers was treated for a laceration (cut). Of the workers treated for strains, sprains, or musculoskeletal pain, almost 40% had a back injury.

Hospital admissions (charts 1-I through 1-L): Over this seven-year period, 105 workers had injuries that were serious enough to require inpatient admission to the hospital –3.6% of all visits. Three workers died from their injuries; these cases are included here. While about 60% of the workers admitted to the hospital had short stays of one or two days, the remaining workers had lengthy stays –several longer than a month. The percentage of injuries admitte d to the hospital varied substantially among trades and by ethnicity or race.

The large proportion of Hispanic workers admitted to the hospital might be because that group is over-represented in the more basic trades, which are often considered to be more dangerous, or may otherwise be assigned more hazardous work. Alternatively, perhaps

injured Hispanic workers are more reluctant to seek treatment for some of their less-serious injuries because of immigration status or other issues (s Anderson, Hunting, and Welch 2000).

Selected injuries and circumstances by trade (charts 1M through 1S): The injury patterns reflect the job tasks and hazards and provide a starting place for deciding how to make the job safer. More detail for each of these types of injury can be found in the trade-specific injury profiles. Except on charts 1-M, 1-N, and 1-P, the injuries that are highlighted are fairly uncommon within most trades. Thus

and other combustion equipment in inadequately ventilated spaces (see Nessel-Stephens and others 1995). Many construction workers with these types of problems will not seek emergency treatment

Chart 1-A

2,916 injured construction workers

Age of injured workers

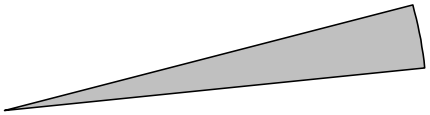


Chart 1-C

2,916 injured construction workers

Trades of injured workers

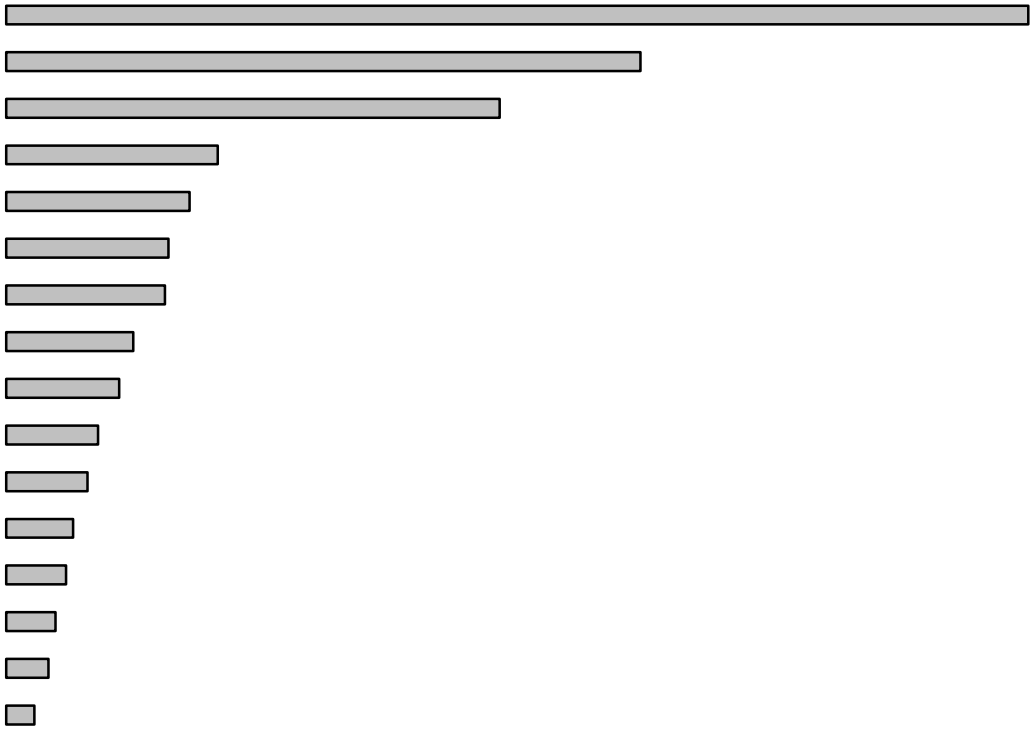
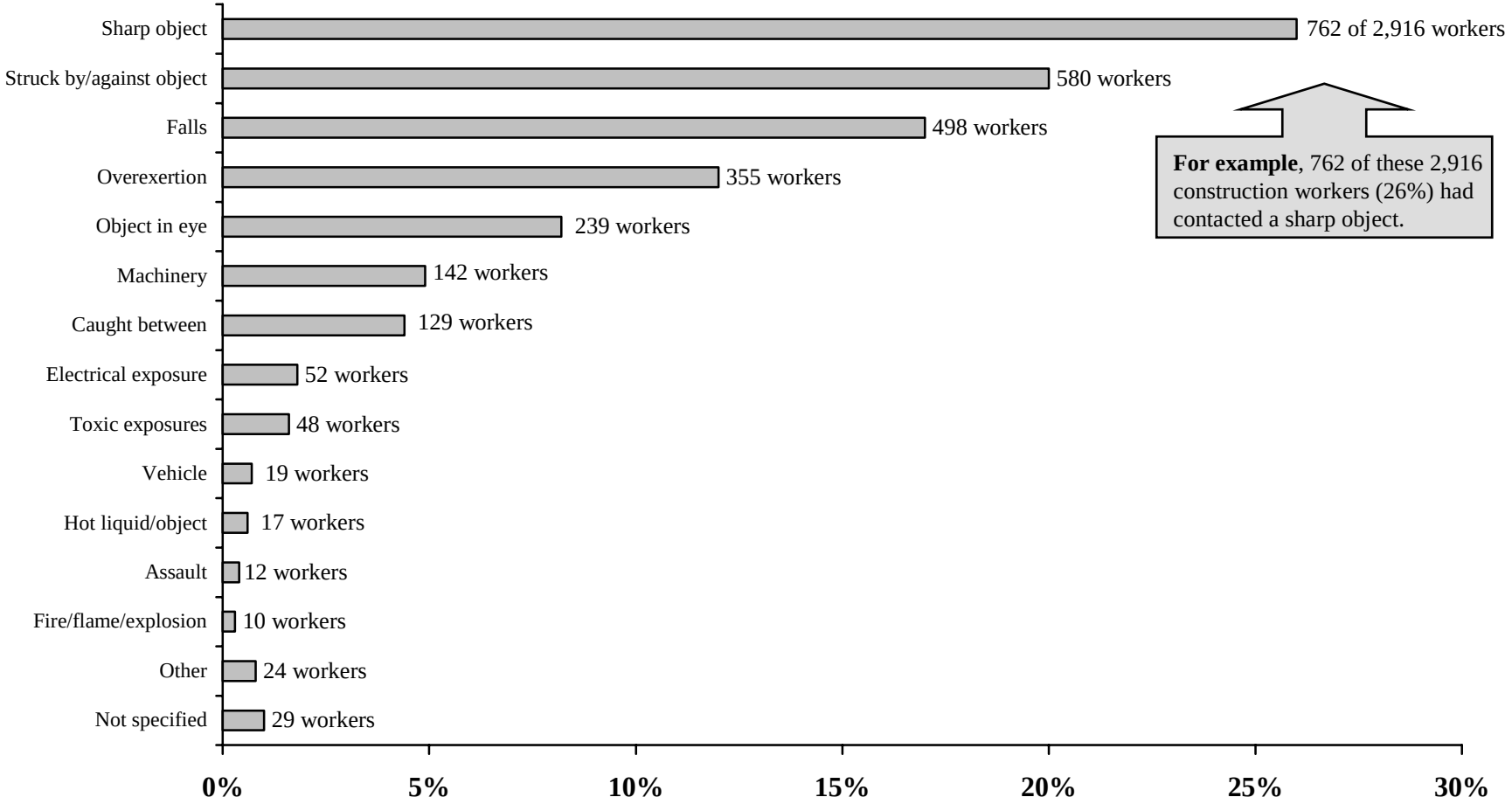


Chart 1-D

2,916 injured construction workers

Causes of injury



Percentage of all injured workers by cause of injury

Chart 1-E

2,916 injured construction workers

Detailed causes of injury, rank 1-3

RANK #1	26%
SHARP OBJECT	**762**
metal/sheetmetal/duct	170
razor/knife	128
power tool, incl. saw (25), drill (18), screw gun (17), nail gun (13)	92
nail/screw	78
hand tool, incl. hacksaw (12), chisel (8)	48
metal stud	40
cable/wire	36
glass	34
light fixture	21
w	

RANK #2	20%
STRUCK BY/AGAINST OBJECT (INCL. FALLING OBJECT)	**580**
pipe	52
board/wood	46
beam	44
metal/sheetmetal/duct	39
hammer/sledge	33
metal object/plate	36
scaffold	26
ceiling/wall	25
rebar/metal bar	24
cinder block/brick/stone	17
granite/marble/stone	16
hand tool, other than hammer	15
door	14
concrete/cement	13
drill	13
drywall/plaster	13
box/crate/toolbox	12
power tool, other than drill	12
wire/cable	11
light fixture	7
cart/dolly	6
door jamb/doorway	5
truck	5
table	4
other	64
not specified	28

RANK #3	17%
FALL	**498**
from ladder	135
slip/trip/stumble	99
from scaffold	80
from another level	59
from stairs	30
out of a building/structure	26
into a hole	21
not specified	48

Chart 1-E, continued

2,916 injured construction workers

Detailed causes of injury, rank 4-6

RANK #4	12%
OVEREXERTION / STRENUOUS MOVEMENT	**355**
lifting/carrying	193
pushing/pulling	32
stepping on/off, walking	24
bending over	10
while drilling	9
using hammer/sledge	7
stopping a fall/falling object	6
overhead	4
using jackhammer	4
other	36
not specified	30

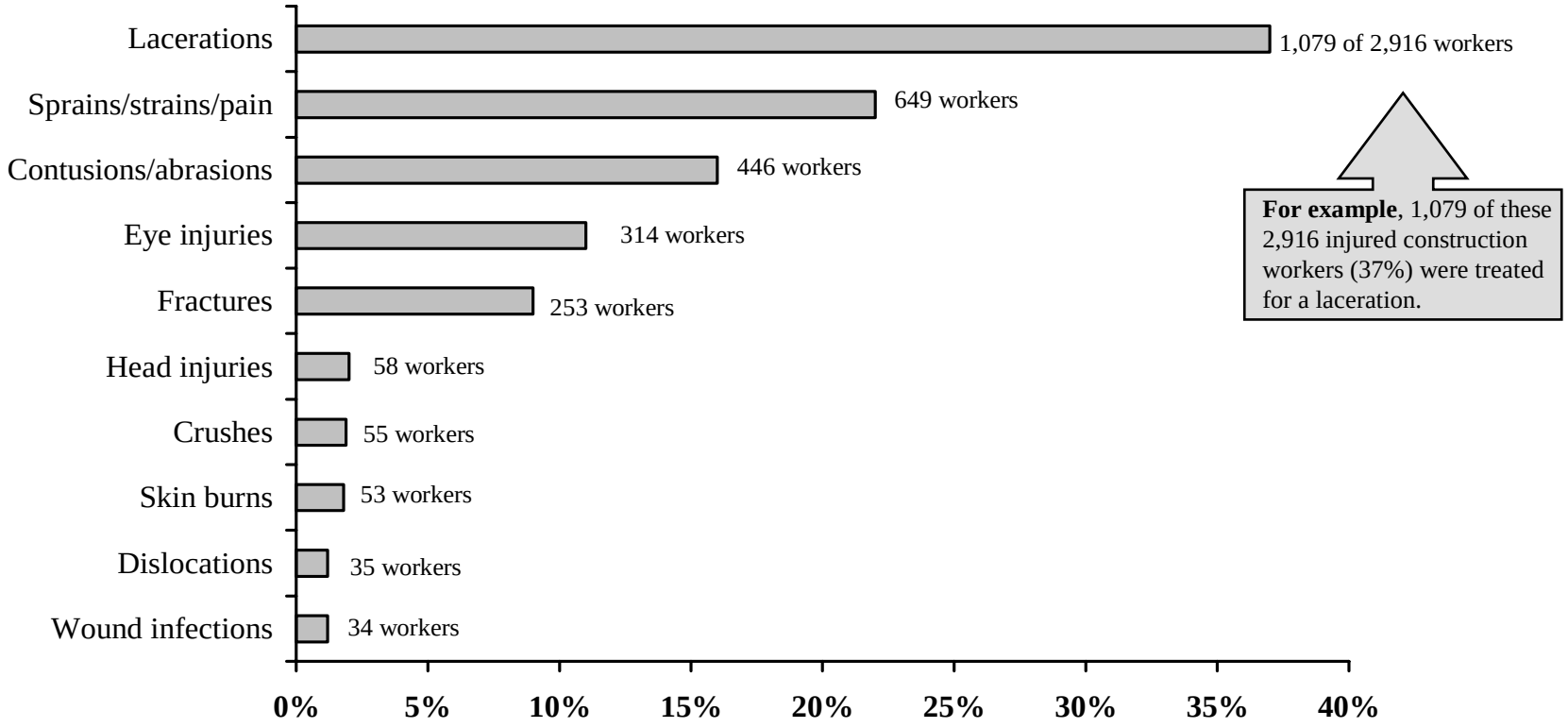
RANK #5	8%
OBJECT IN EYE	**239**
concrete/cement (dust or wet)	53
metal dust	39
chemical	25
dirt/dust/debris	24
drywall/plaster	12
paint (dust or wet)	11
wood dust	10
insulation	9
rock/stone/gravel	6
ceiling tile	5
other	11
not specified	34

RANK #6	5%
MACHINERY RELATED	**142**
power saw (woodworking)	32
grinder	18
welder/solderer	17
crane	13
forklift	10
bobcat/front-end loader	8

Chart 1-F

2,916 injured construction workers treated for 3,207 diagnoses

Top ten injury diagnoses



*Note: Percentages add to more than 100 because some injured wr fc 0.0014 0 TD 7

Chart 1-I

Percentage of injured workers in selected trades admitted to the hospital

(105 of 2,916 injured workers were admitted to the hospital)

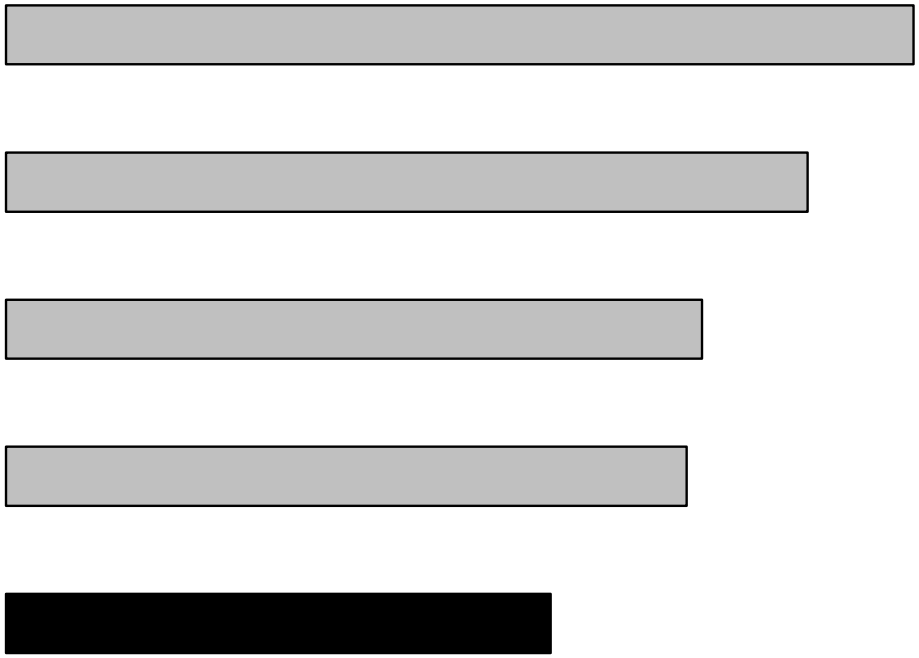
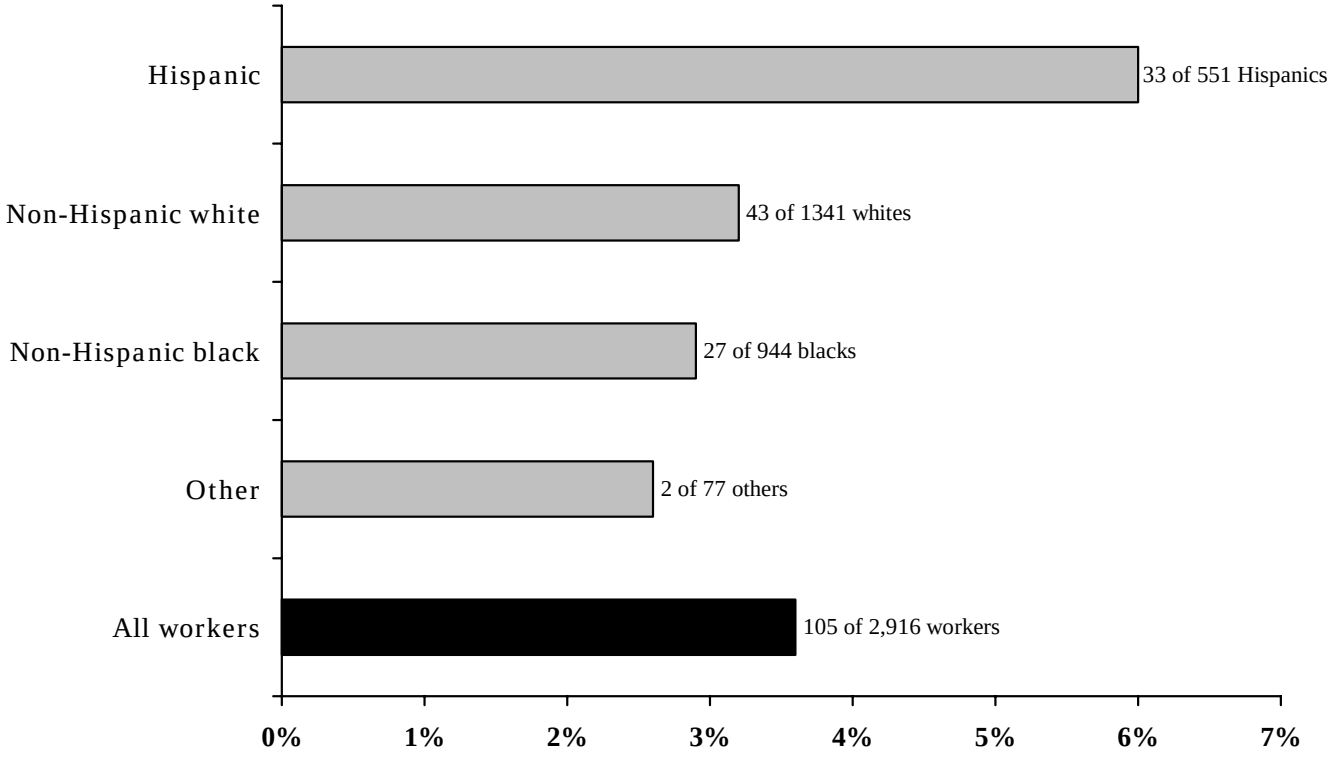


Chart 1-J

Percentage of injured workers in each ethnic or racial group admitted to the hospital

(105 of 2,916 injured workers were admitted to the hospital)



- Hispanic includes white and black.

Chart 1-K

Causes of injury for 105 workers admitted to the hospital

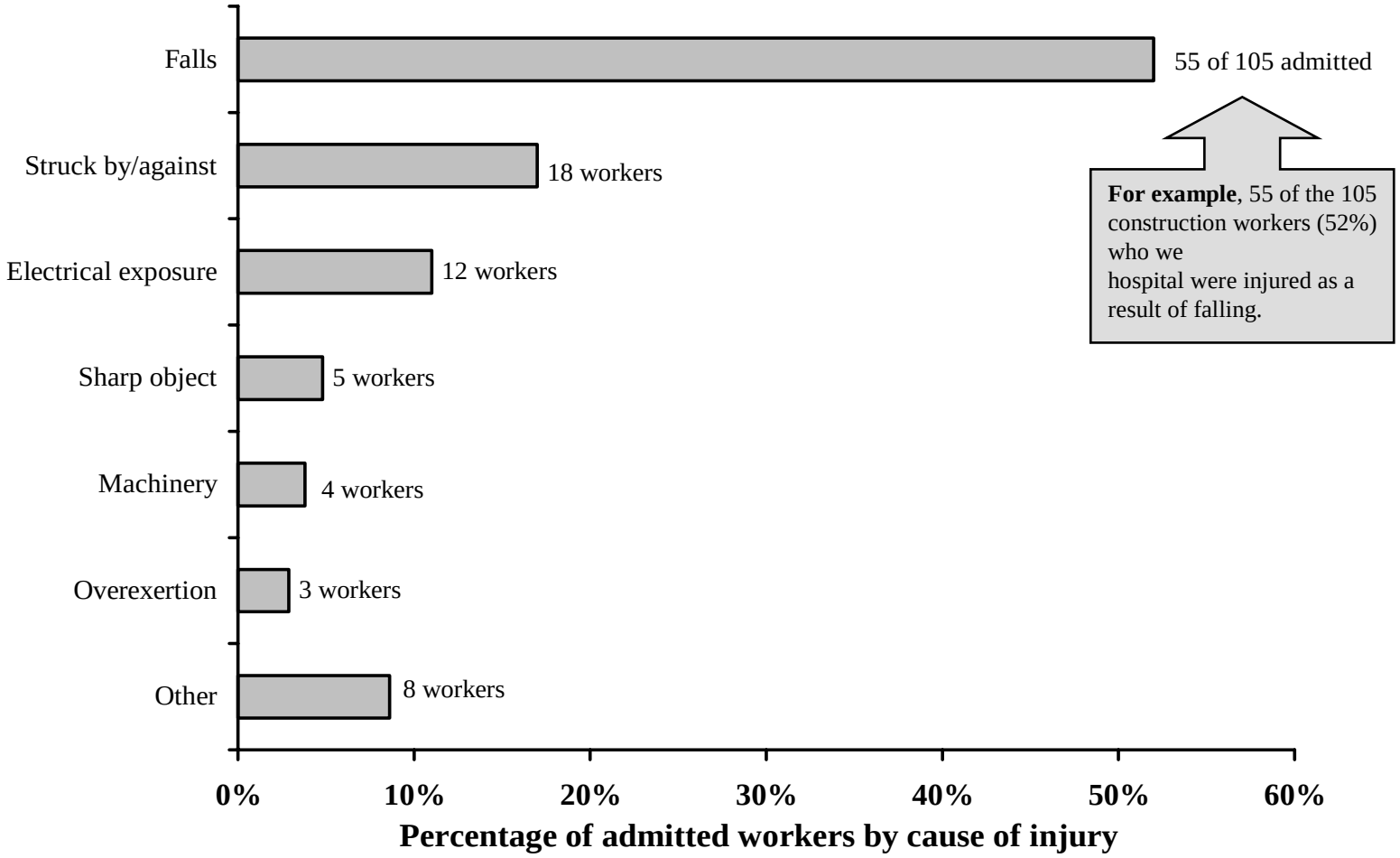


Chart 1-L

Top ten injury diagnoses* for 105 workers admitted to the hospital

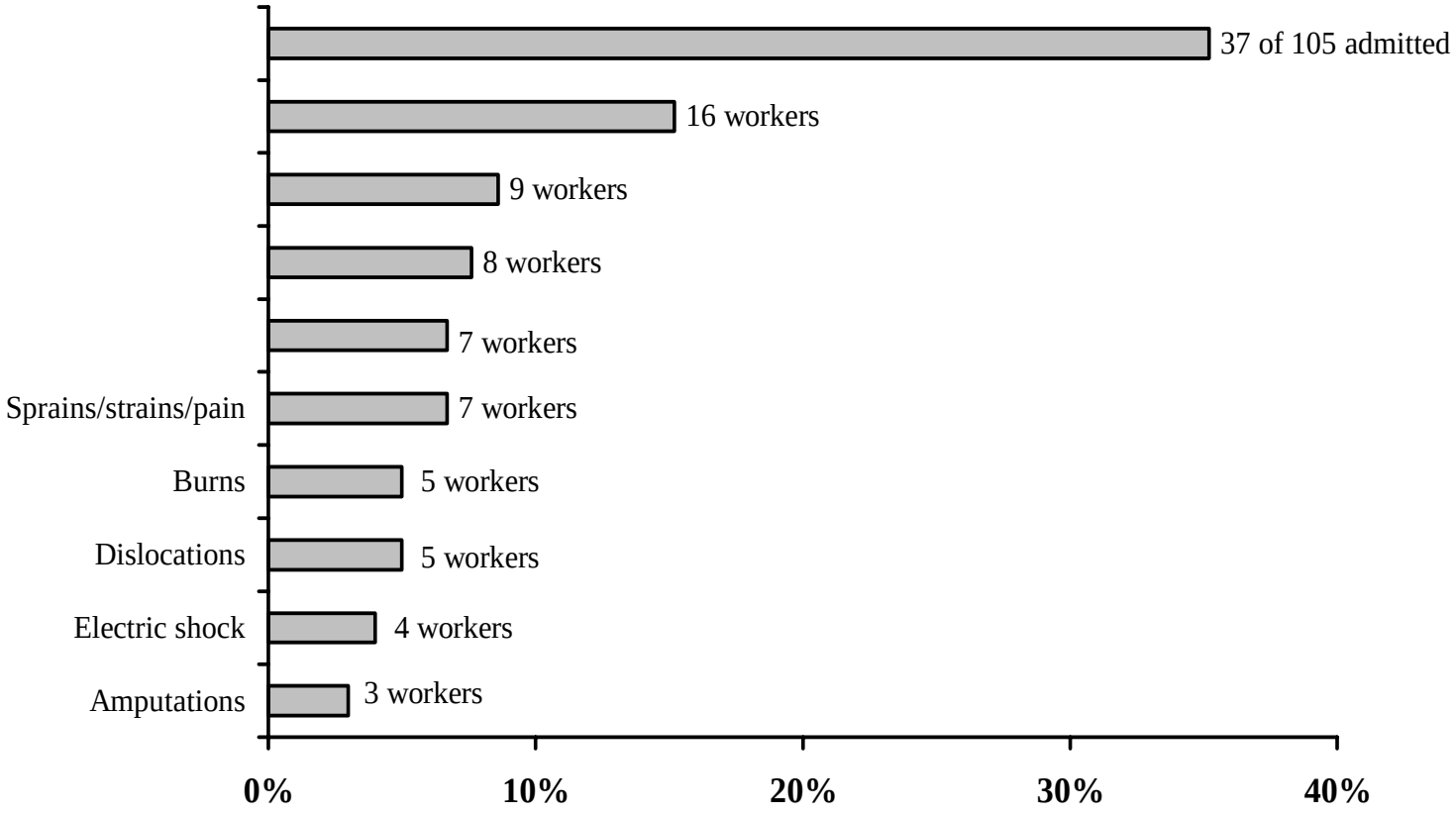


Chart 1-M

Percentage of injured workers in selected trades who fell from a height

(352 of 2,916 injured workers fell from a height)

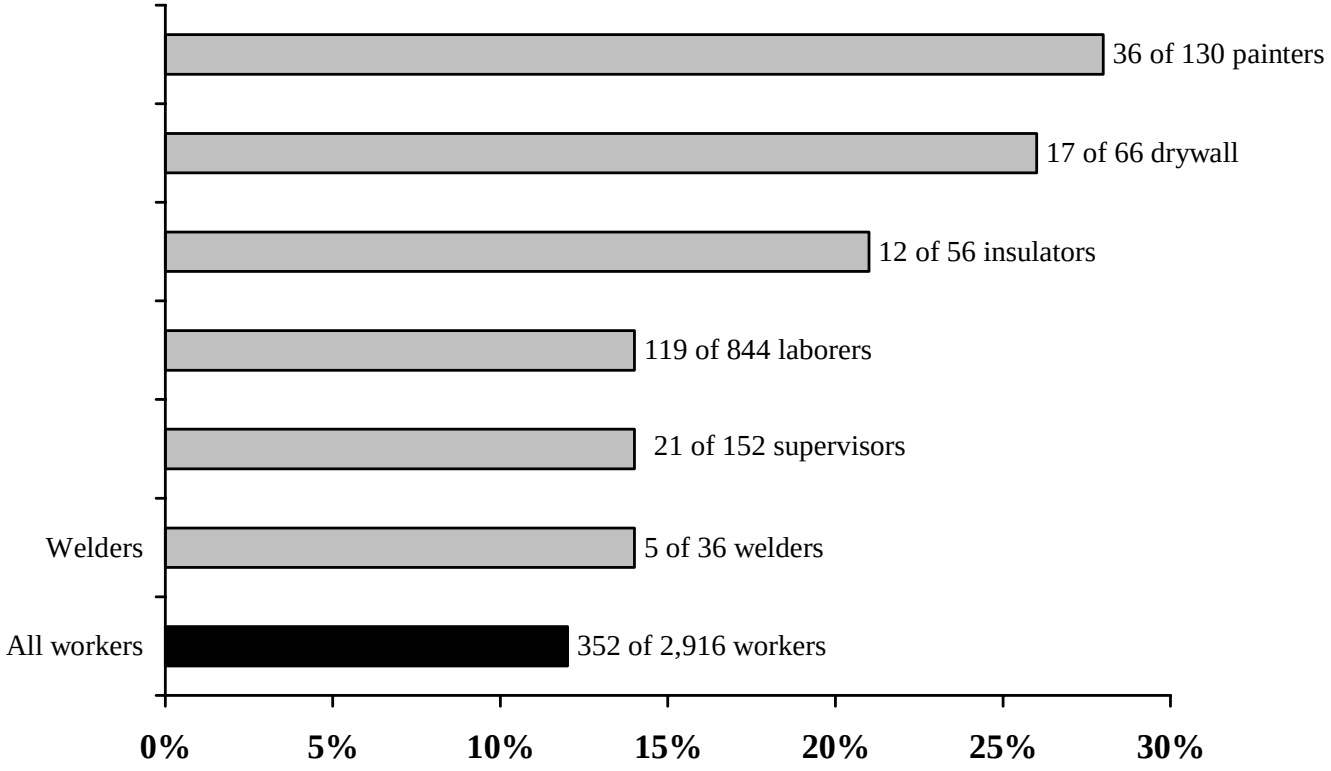
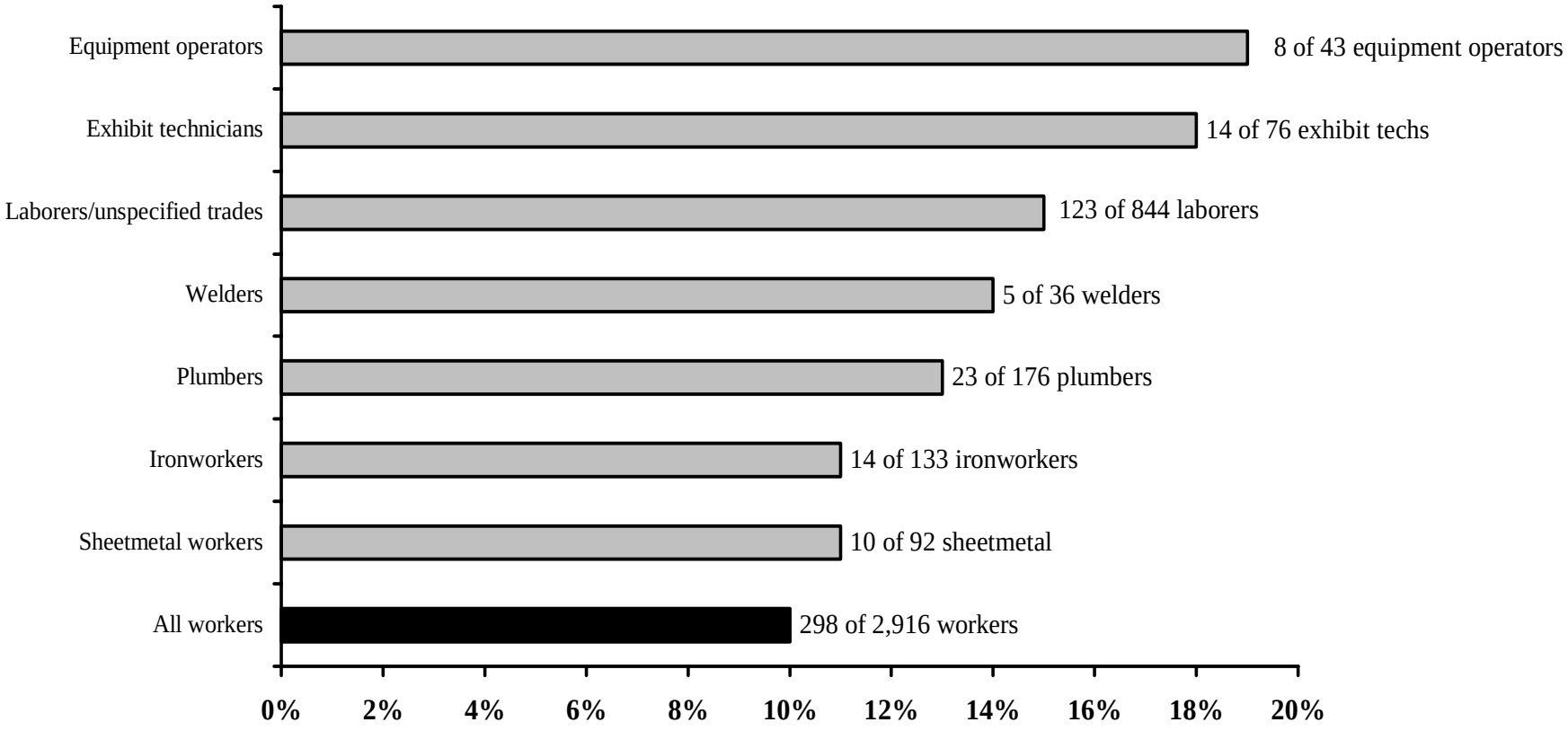


Chart 1-N

Percentage of injured workers in selected trades struck by a falling object

(298 of 2,916 injured workers were struck by a falling object)

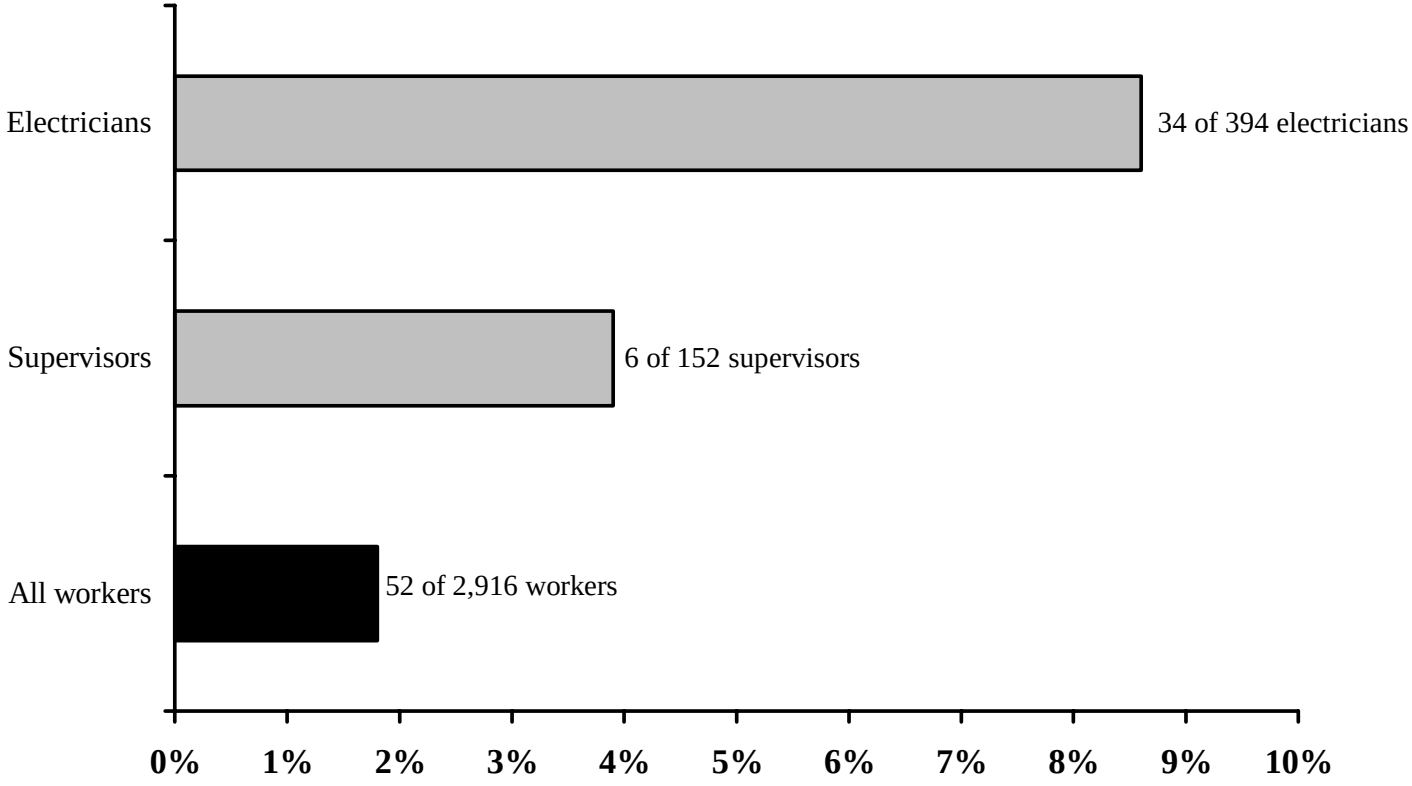


Percentage of injured workers in each trade struck by a falling object

Chart 1-O

Percentage of injured workers in selected trades injured by electrical current

(52 of 2,916 injured workers were injured by electrical current)



Percentage of injured workers in each trade injured by electrical current

Chart 1-P

Chart 1-Q

Percentage of injured workers in selected trades treated for burns

(67 of 2,916 injured workers were treated for a skin or eye burn)

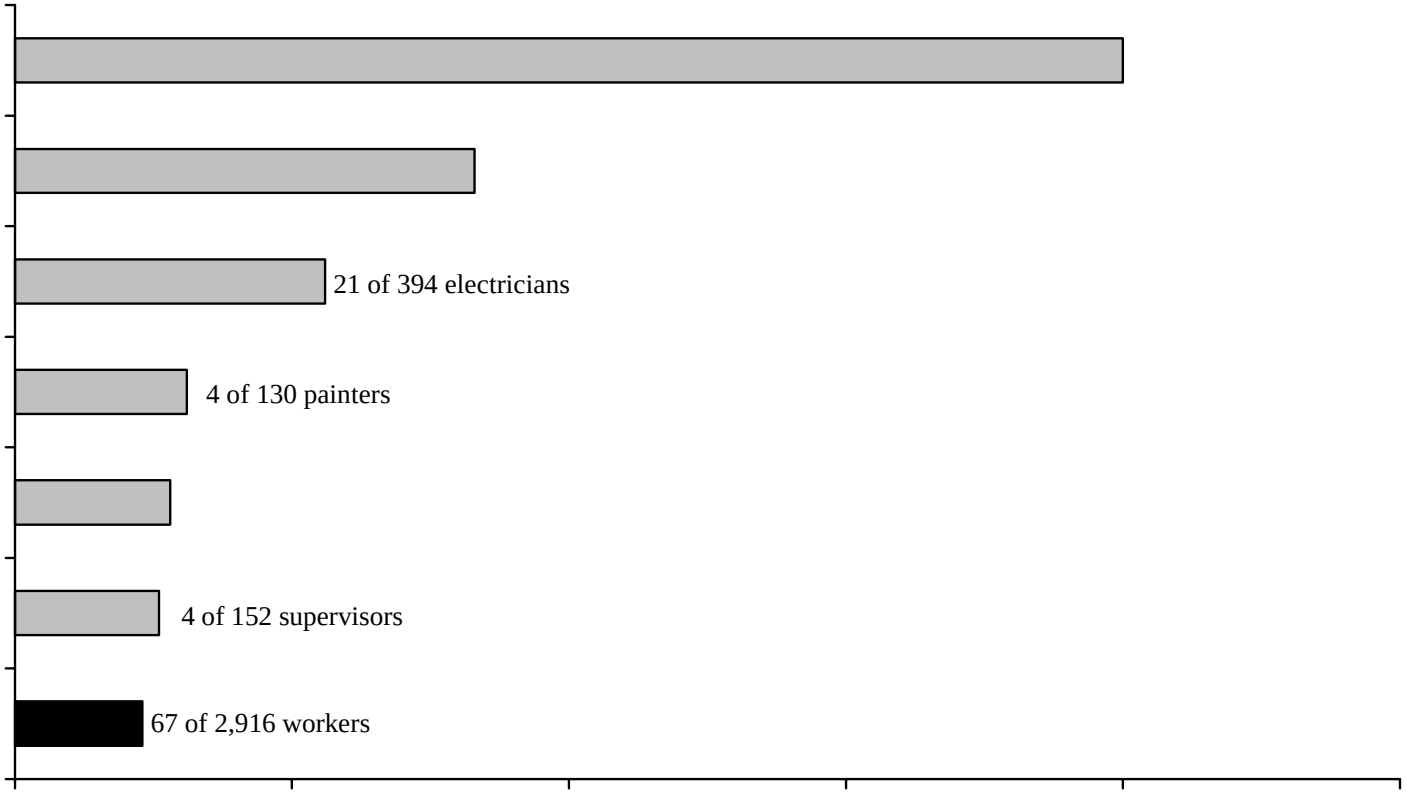
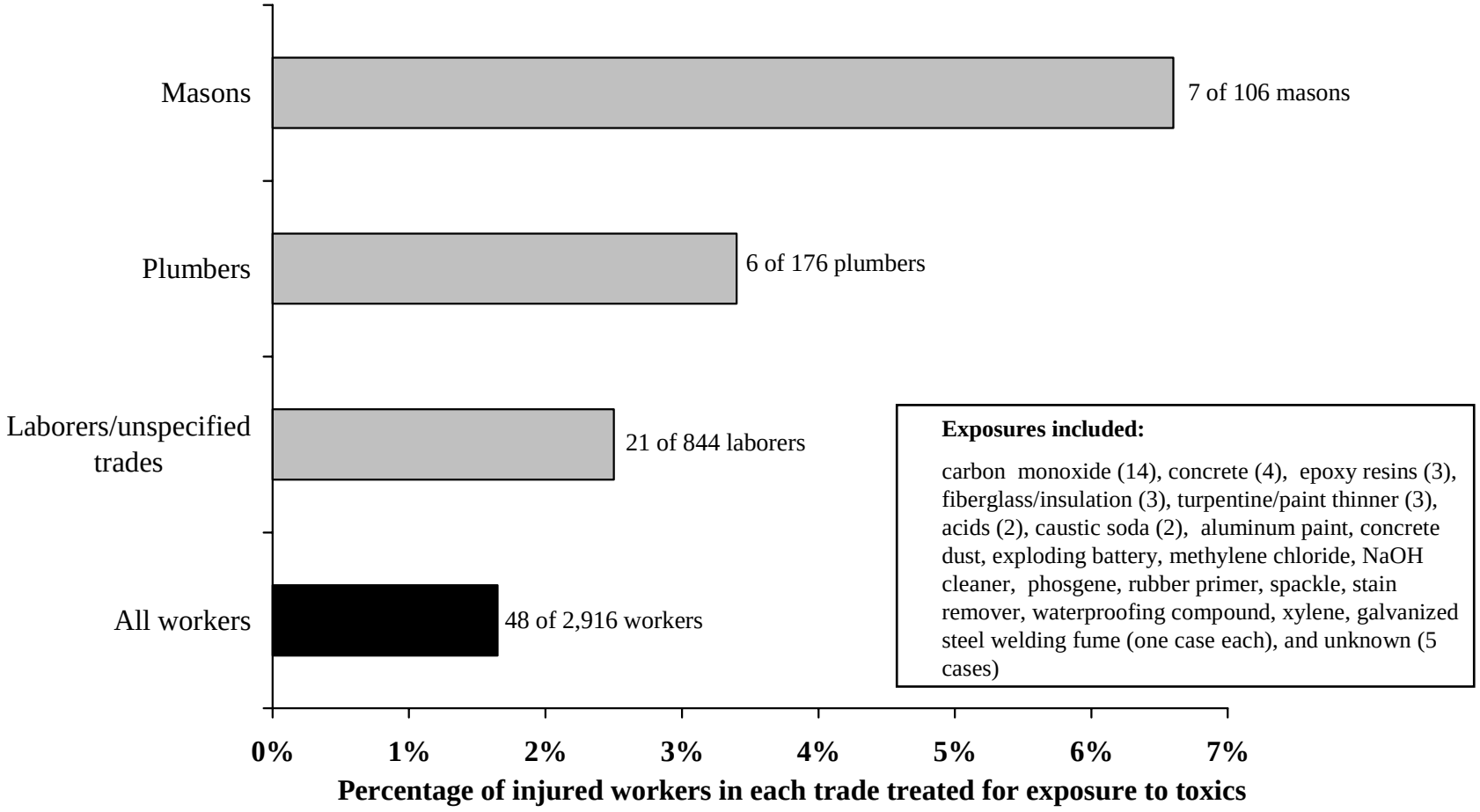


Chart 1-R

Percentage of injured workers in selected trades treated for toxic liquid/gas/dust exposure

(48 of 2,916 injured workers were treated for a toxic exposure injury)



GWU Emergency Department injury data, 11/90 - 10/97

Laborers

IN THIS REPORT, we have combined the 612 workers who called themselves laborers with the 232 workers who described themselves only as "construction workers" when they visited the GWU Emergency Department. Interviews with some of these workers who did not specify a trade when they registered in the emergency department confirm that most of them are laborers. Also, there were no obvious differences between the injury profiles of workers who called themselves laborers and those who called themselves general construction workers. The two groups combined (844 cases) were seen more frequently than any other trade, and make up 29% of all the construction injury cases seen at the George Washington University Emergency Department (Welch, Hunting, and Anderson 2000).

Demographic Characteristics: The age range of laborers was similar to the range of all workers, with two-thirds of injured workers younger than 40. The age range was broad, from 12 to 74 years. Forty-one percent of the injured laborers were black and 36% were Hispanic. This is in contrast to injured construction workers from other trades, where only 29% were black and 12% were Hispanic. Hispanics may be black or white, but are included here in their own group.

Causes of Injury, Diagnoses, and Body Locations (charts 2A –2E) : The circumstances of injury for laborers differed from those of all other construction workers. For instance, one-quarter of the laborers were treated for an injury that was caused by being struck by or striking against an object. This includes being struck by a falling object. Although the types of objects involved were generally similar whether the worker was a laborer or from another trade, certain objects – such as beams and masonry blocks, bricks, or stone – were involved in a higher proportion of laborers' injuries. For laborers compared with all other trades, a higher proportion of falls resulted from slips, trips, and falls on the same level and falls from scaffolds.

Some of the rare but serious injuries were more common among laborers. For example, 29 of the 844 laborers (3.4%) were treated for head injuries compared to 29 of the 2092 workers in the other trades (1.4%). Information on hard hat usage was not available, but there is no reason to believe that laborers are less likely than workers in other trades to wear hard hats.

Laborers were more likely to have lower-extremity injuries (foot/ankle and knee/leg/hip).

Hospital admissions (charts 2-F and 2-G): Compared to injured workers in all other trades, a greater proportion of the injured laborers were admitted to the hospital. Among laborers 57% of admissions were the result of falls, compared to 43% among other trades combined. Fifteen of the seventeen construction workers hospitalized after being struck by beams were laborers, indicating that

laborers may be at particular risk for this type of injury. Fully half of the hospitalized laborers had fractures, some to more than one part of their body.

Although a rate of injury or hospitalization for laborers cannot be calculated from these data, the patterns here suggest that laborers have more serious injuries than do other construction workers. Other studies of construction injuries show that laborers have more severe injuries (,

Chart 2-A

844 injured laborers

Causes of injury

Compared to 2,072 other injured construction workers

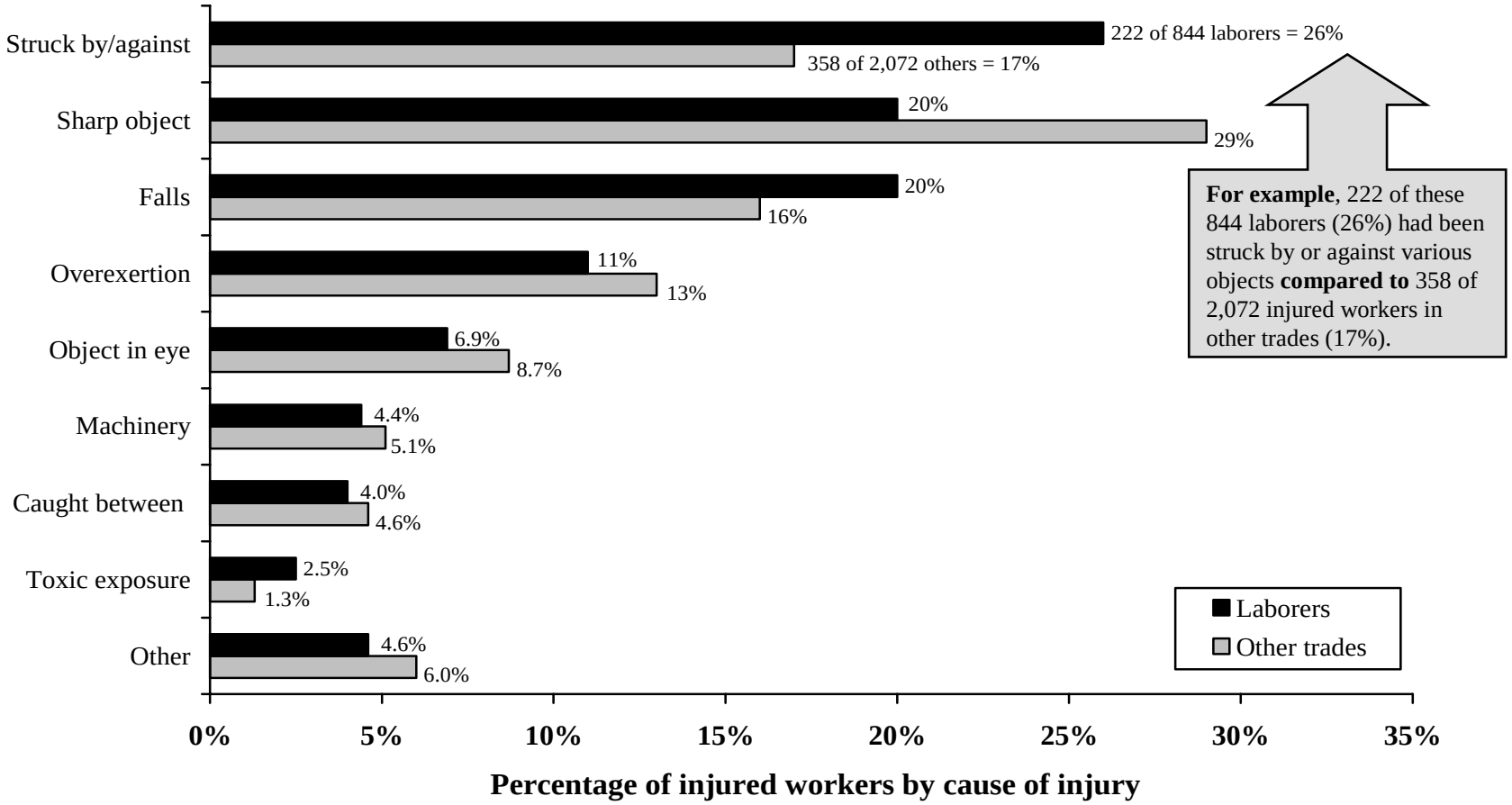
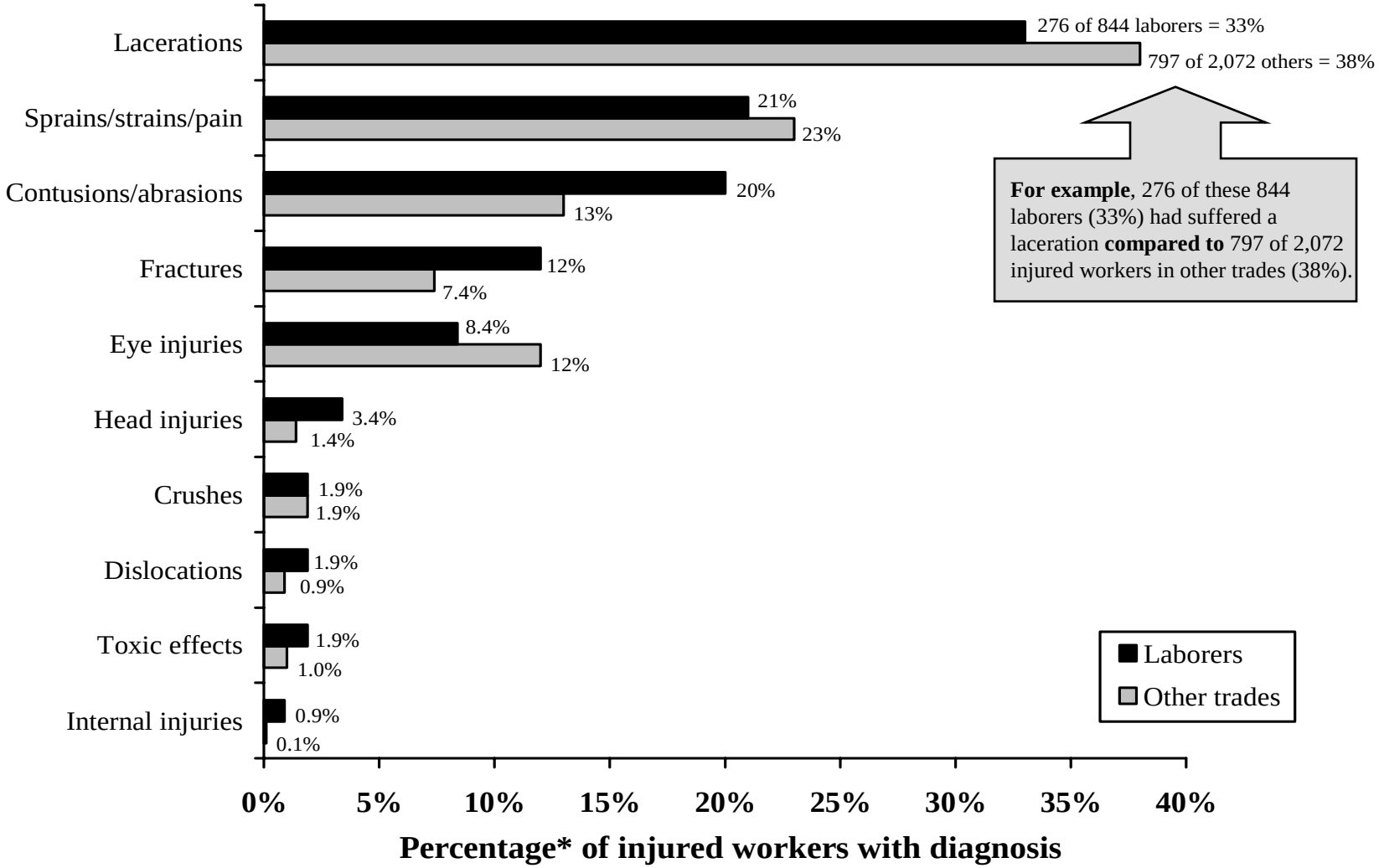


Chart 2-C

844 injured laborers treated for 962 diagnoses

Injury diagnoses

Compared to 2,072 other injured construction workers treated for 2,245 diagnoses



*Note: Percents add to more than 100 because some injured workers had more than one diagnosis.

Chart 2-D

844 injured laborers treated for 962 diagnoses

Injured body parts

Compared to 2,072 other injured construction workers treated for 2,245 diagnoses

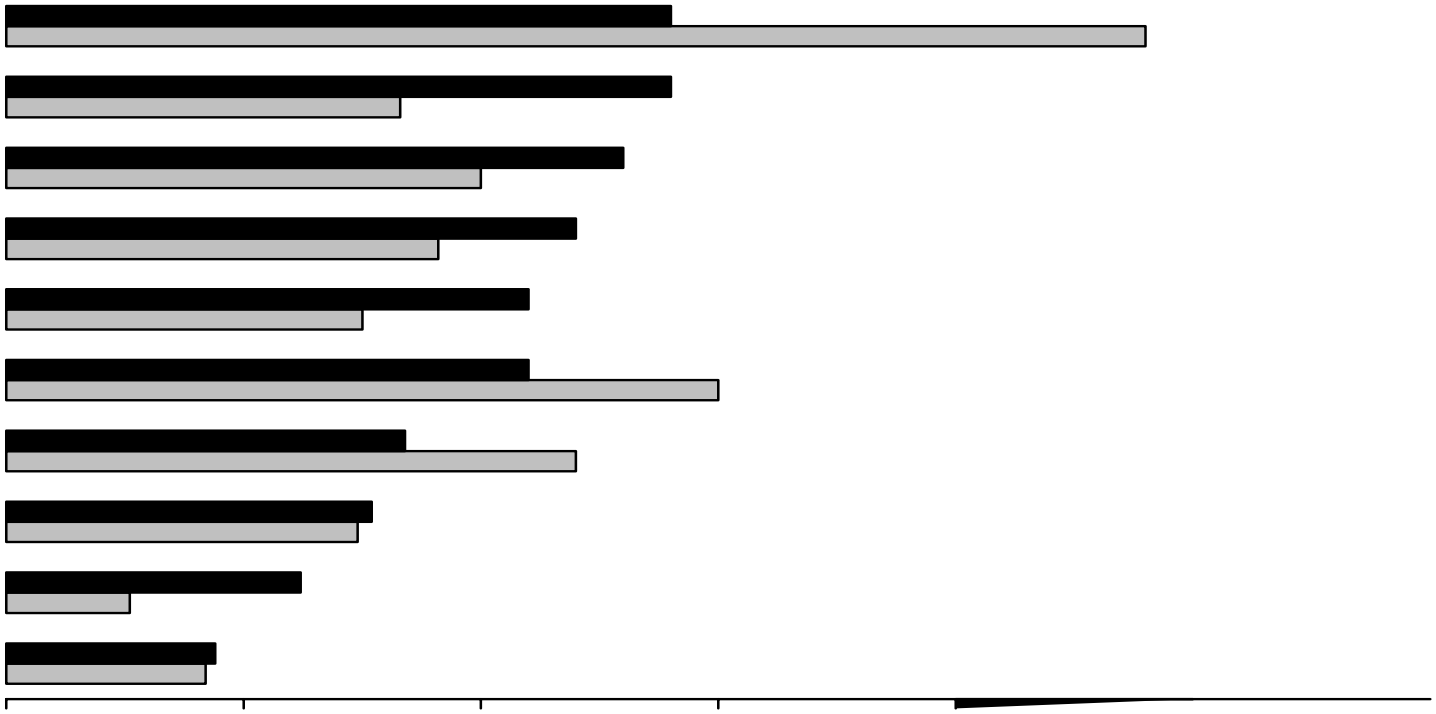


Chart 2-E

844 injured laborers treated for 962 diagnoses

Diagnoses by body part

RANK #2	21%
SPRAIN, STRAIN, PAIN	**178**
low back	83
ankle/foot	29
knee/leg/hip	25
neck	18

Chart 2-F

844 injured laborers

Causes of injury for 51 laborers admitted to the hospital

Falls from Scaffolds (14)

fell 20 to 50 ft off scaffolds (7 cases)

fell 12 to 15 ft off scaffolds (4 cases); one of these workers was then struck on the abdomen by the falling scaffold bar

fell 10 ft or less (3 cases); one of these fell on his head and has no memory of the incident

Falls from Buildings and Other High Places (9)

fell 50 ft from

Chart 2-G

844 injured laborers

Diagnoses* of 51 laborers admitted to the hospital

Falls

29 cases, 57% of admissions

Among 20 workers who fells more than 10 feet:

10 had fractures, including: face (2), shoulder (2), collarbone (2), ribs (2), pelvis (2), leg (2), wrist

7 had head injuries, with or without loss of consciousness

5 had internal injuries, including: severe chest injuries (2), blood loss anemia , vomiting blood, bruised kidney

2 had lacerations, both to the face/head

1 had bruised ribs

3 had sprains, strains, or musculoskeletal pain, including: ankle sprain, chest pain, low back pain

Among 9 workers who fell less than 10 feet:

5 had fractures, including: ankle (2- both with dislocation), elbow (2), lower leg, face

2 had head injuries, with or without loss of consciousness

1 had a puncture wound 4" deep to the anal/scrotum area

1 (a hemophiliac) had a hemorrhage in his leg muscle

1 dislocated his shoulder

Struck by/Struck Against

15 cases, 29% of admissions

Among these 15 workers struck by beams or other objects:

7 had fractures, including: leg (3), face (2), skull, multiple finger, toe

3 had internal injuries, including: one with a bruised kidney, one with a ruptured spleen and blood loss anemia, and one with a nosebleed and coughing blood

3 had unspecified injuries, including: multiple injuries (2), face and neck injuries

1 had a head injury with seizures

1 had pain in his left side

Other Injuries

7 cases, 14% of admissions

Among the 7 workers with other injuries:

4 had fractures, including: forearm, wrist, shoulder, pelvis, lower leg, ankle

1 had skin graft complications following a burn

1 had a wound infection following a laceration

1 had heart palpitations and chest pain

*Note: Some of these laborers had more than one diagnosis. Minor diagnoses which were not likely to lead to hospital admission have been omitted from this chart.

Carpenters and Carpet Layers

BETWEEN November 1, 1990 and October 31, 1997, 537 construction workers identified themselves as carpenters or carpet layers when they were treated for work-related injuries at the George Washington University Emergency Department. Of these workers, most were carpenters (96%) who work in construction settings (436 workers) or maintenance settings (77 workers); the other 24 were carpet layers. In the interest of brevity, carpenters (whether construction or maintenance) and carpet layers are referred to as "carpenters."

Compared to other construction trades, carpenters had the second-highest number of emergency department visits during this time (chart 1-C). The proportion of hospital visits for injuries related to carpentry work might be even higher, given that other trades sometimes perform carpentry tasks. For example, laborers are sometimes assigned formwork (making wood frames for pouring concrete) and drywallers, plasterers, and glaziers are assigned finishing work. This section does not include workers who construct and install conference exhibit booths. The injuries of exhibit technicians (who sometimes identify themselves as carpenters) were studied separately because their tasks are likely to be considerably different from those of more traditional carpenters.

Demographic Characteristics: Women made up a small fraction (3.2%) of the injured carpenters. The ethnicity of the injured carpenters differed somewhat than for the other injured workers. A higher proportion of injured carpenters was white (60% of carpenters versus 43% of other trades) and a lower proportion were black (21% of carpenters versus 35% of other trades). The age distribution of carpenters was similar to that of the other injured workers.

Causes of Injury, Diagnoses, and Body Locations (charts 3-A through 3-E): Almost 40% of the carpenters who visited the emergency department had been injured by contact with a cutting or piercing object, most commonly a knife, power tool, or piece of metal. Of the 24 carpet layers alone, 17 cut themselves with a knife. Slips and trips on the same level made up most of the Emergency Department visits that resulted from carpenters falling on the job.

Power saws were responsible for many lacerations as well as contusions and more serious injuries from kickback of cut materials. Similarly, power tools other than saws (such as drills, screw guns, and nail guns) accounted for a disproportionate portion of injuries among carpenters (5.0% versus 2.8% among other workers). Another cause of injury seen more often among carpenters was being struck by scaffolds (1.7% versus 0.7%); some carpenters assemble and disassemble scaffolds.

It is interesting to compare the GWU Emergency Department injury data for carpenters with workers' compensation data evaluated by Lipscomb, Kalat, and Dement (1996).The workers' compensation data for carpenters found a higher proportion of strains and sprains,

and a lower proportion of lacerations. This is usually the pattern that is seen when comparing emergency department and workers' compensation data on occupational injuries. Falls made up almost identical proportions of the two injury studies.

Hospital Admissions (chart 3-F): The 12 injuries that resulted in a hospital admission represent 2.2% of carpenters' injuries treated at the Emergency Department.

Recommendations: A high priority for this trade should be to prevent injuries from table saws and other stationary woodworking machinery, from portable power saws, and from other power tools. Guards should not be removed from these machines and tools unless there is a written procedure describing how a cut will be done safely. Workers should be thoroughly trained in how to use machinery safely and how to inspect it properly. Another injury prevention program might focus on identifying and using utility knives with safety features, and encouraging workers to take special precautions when cutting materials and changing the blades. It would also be worthwhile to explore the feasibility of wearing gloves that could protect the hands from sharp metal edges. Given the number of slips and trips on the same level, regular housekeeping and the use of slip-resistant boots need to be promoted. A comprehensive scaffold safety program should address some of the injuries identified. Finally, the number of strains might be reduced

Chart 3-A

537 injured carpenters

Causes of injury

Compared to 2,379 other injured construction workers

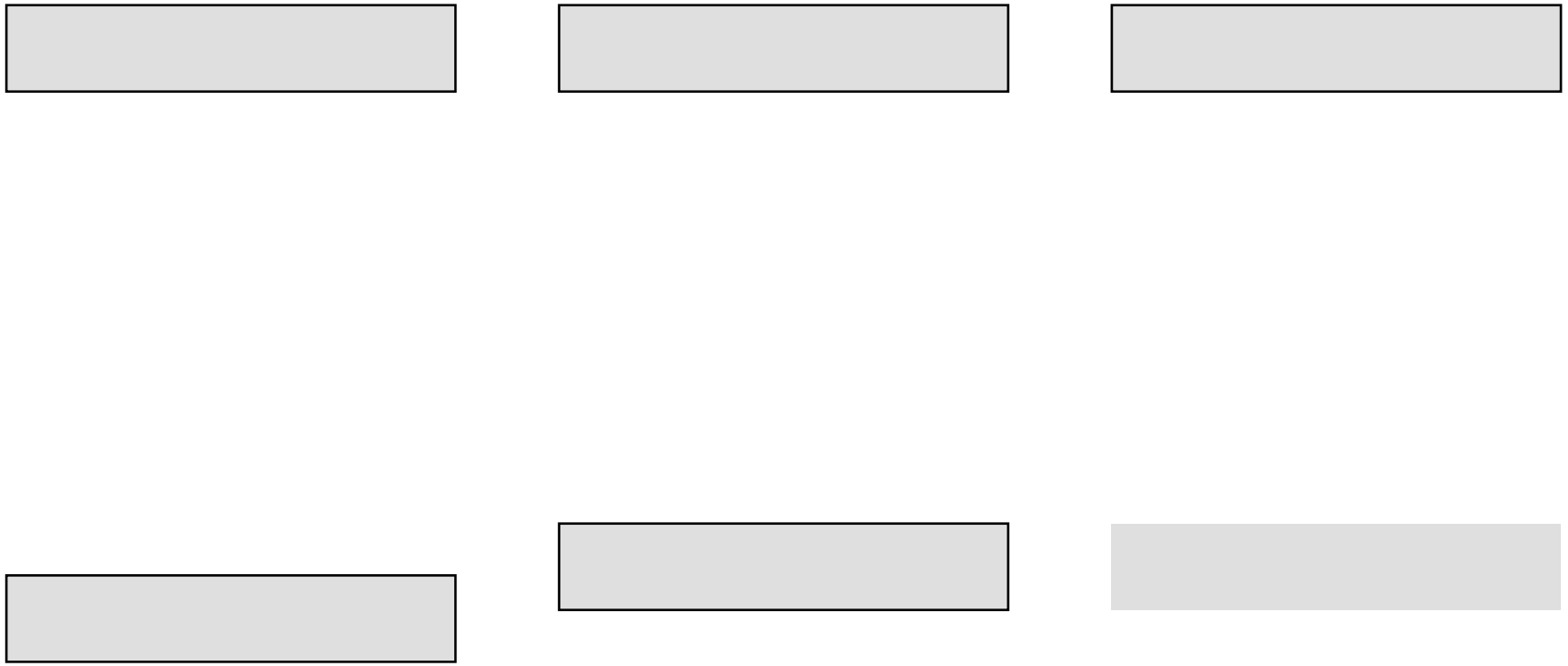
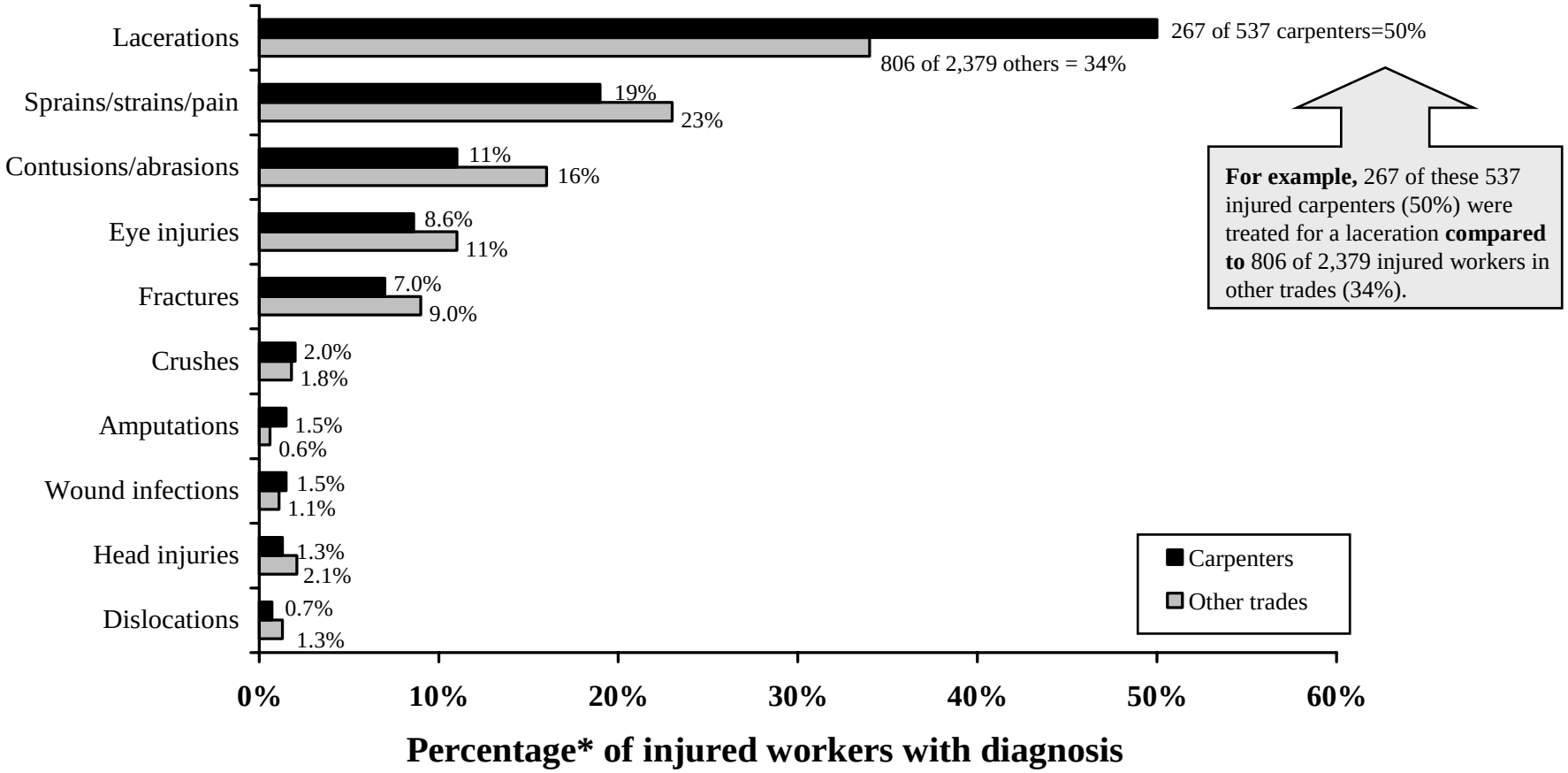


Chart 3-C

537 injured carpenters treated for 568 diagnoses

Injury Diagnoses

Compared to 2,379 other injured construction workers treated for 2,639 diagnoses



For example, 267 of these 537 injured carpenters (50%) were treated for a laceration **compared to** 806 of 2,379 injured workers in other trades (34%).

*Note: Percents add to more than 100 because some injured workers had more than one diagnosis.

Chart 3-E

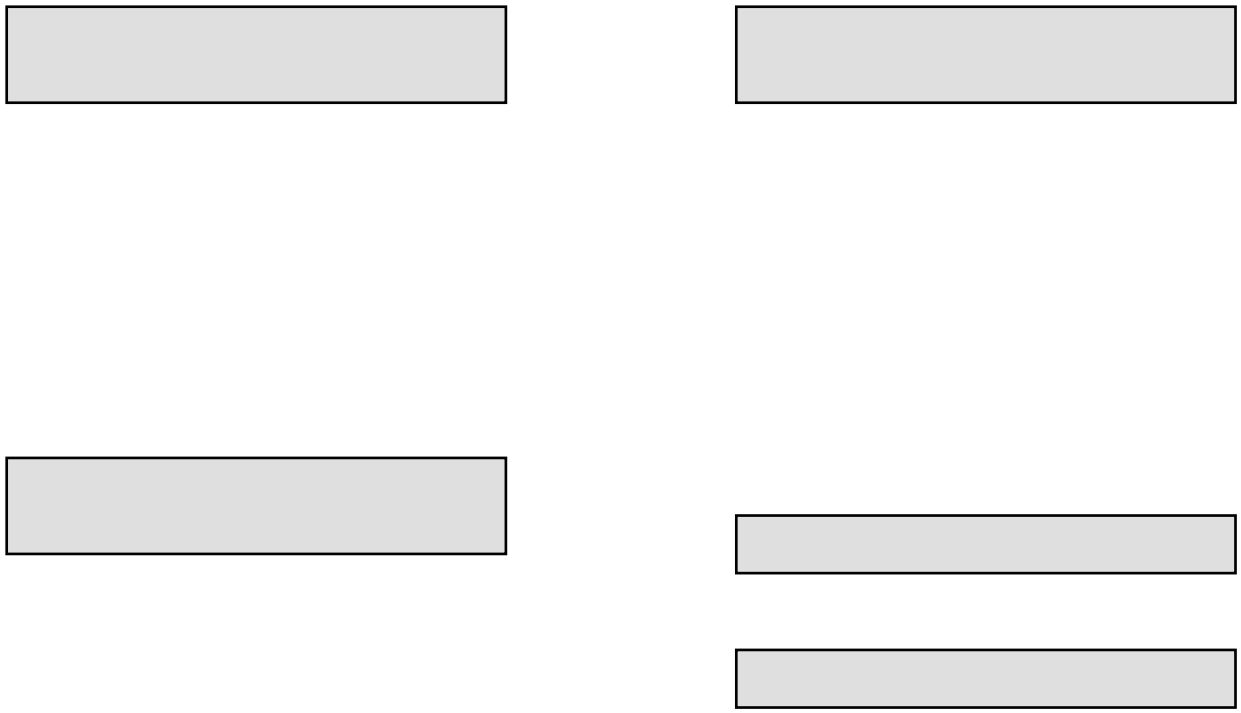


Chart 3-F

537 injured carpenters

Causes of injury for 12 carpenters admitted to the hospital

Fell 25 ft and landed on feet after jumping from steel column that was falling. Patient suffered loss of consciousness and was admitted with severe sprains to both ankles and his wrist.

Fell 12-20 feet from ladder; suffered closed head injury with brief loss of consciousness.

*Although this injury might be considered a fall, the coding system used by the hospital listed the injury as vehicle related.

ƒ Minor diagnoses that were not likely to lead to hospital admission have been omitted from this chart.

Electricians

FROM November 1, 1990 through October 31, 1997, 394 electricians were treated for work-related injuries at the George Washington University Emergency Department..

Demographic Characteristics: Only 1.8% of the injured electricians were women, compared to 3.4% of the other 2,522 injured

Given that more than one in ten electricians studied was treated for an eye injury, it is particularly important to find eye protection that fits properly and is comfortable to wear for long periods of time for those working overhead or using power tools.

Injuries from exposure to electric current are potentially fatal and largely preventable. Electric current caused nearly one-tenth of the injuries that sent electricians to the emergency room during this period. No doubt electricians are acutely aware of the hazards of working with electric current, but training for these hazards could be refreshed periodically with an emphasis on working very conservatively when electric current is involved. That nine workers were injured when they were standing on a ladder that came into contact with electric current illustrates that it is especially important to draw attention to the dangers of this combination.

Chart 4-A

394 injured electricians

Causes of injury

Compared to 2,522 other injured construction workers

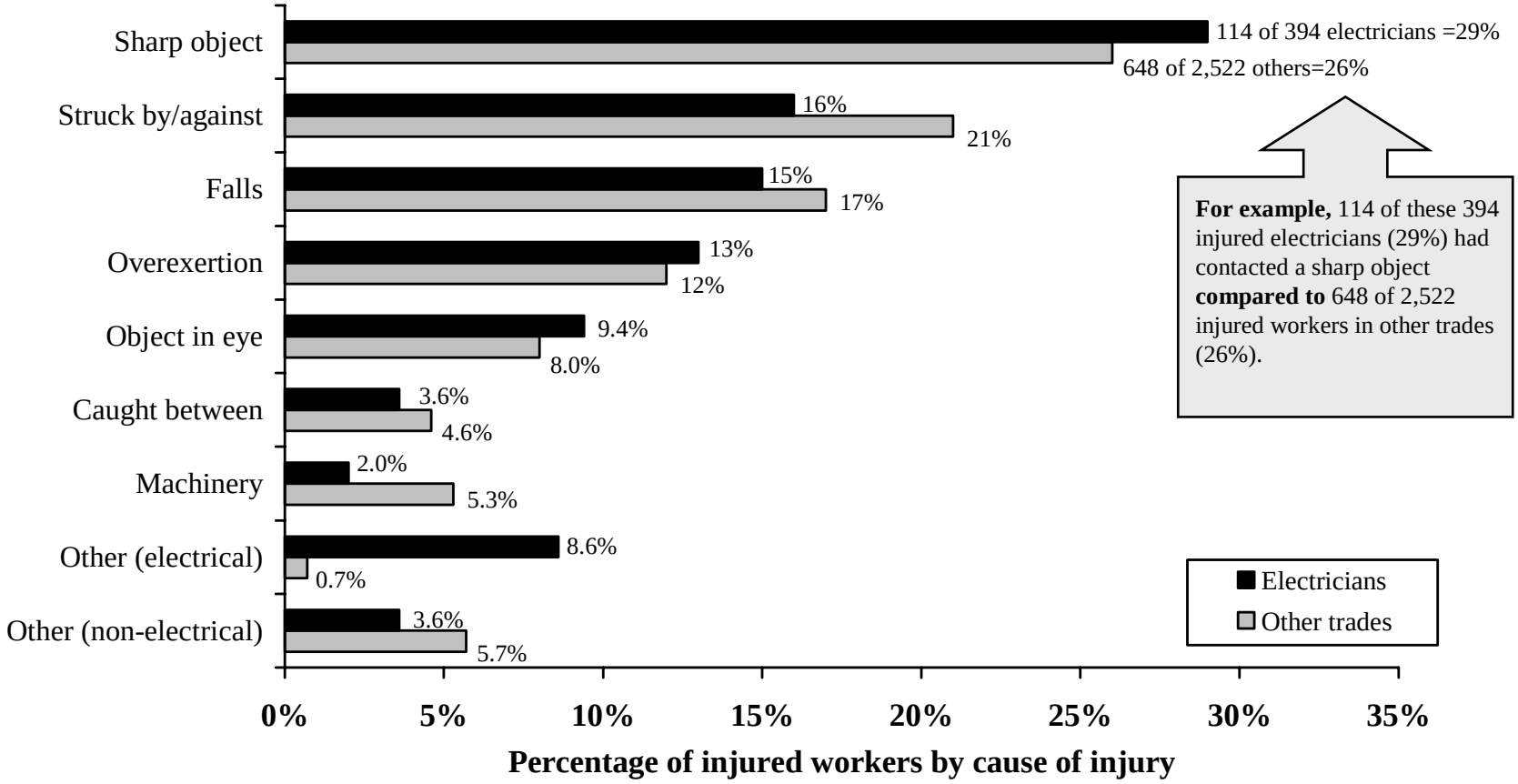


Chart 4-B

394 injured electricians

Detailed causes of injury

RANK #1	29%
SHARP OBJECT	**114**
metal/sheetmetal	22
light fixture	16
hand tool	14
razor/knife	11
me	

RANK #2	16%
STRUCK BY/AGAINST OBJECT (INCL. FALLING OBJECT)	**61**
metal: object, piece, sheetmetal duct, rebar, plate	9
hand tool, hammer/sledge	7
wire/cable	6
light fixture	4
board/wood	4
pipe	4
drill	4
door/door jamb/doorway	4
ceiling/wall	3
other	13
not specified	3

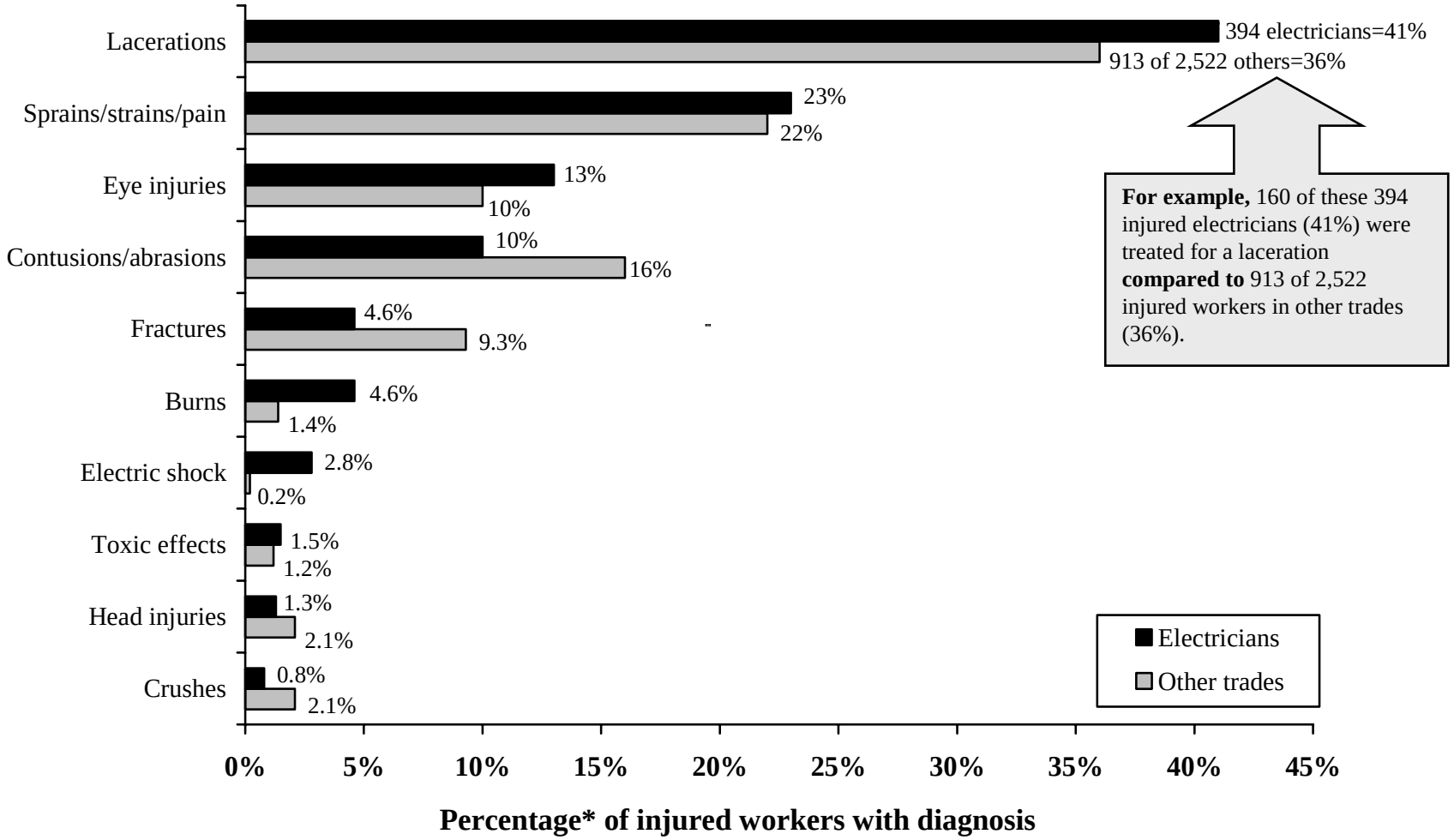
RANK #3	15%
FALL	**60**
from ladder	25
slip/trip/stumble	9
from another level	8
into a hole	5
from scaffold	3
from stairs	2
out of building/structure	1
not specified	7

Chart 4-C

394 injured electricians treated for 425 diagnoses

Injury diagnoses

Compared to 2,522 other injured construction workers treated for 2,782 diagnoses



*Note: Percents add to more than 100 because some injured workers had more than one diagnosis.

Chart 4-E

394 injured electricians treated for 425 diagnoses

Diagnoses by body part

RANK #2	23%
SPRAIN, STRAIN, PAIN	**91**
low back/upper back	30

GWU Emergency Department injur30 0 7cu50 612 792 -0.1(j8(11/-0.1(90 –)24912 710/-0.1(97)]TJ 44.7304 Tw 1929 TD03808 0U Em(

Pipe Trades: Plumbers and Sprinkler Fitters

INJURED WORKERS from the pipe trades –plumbers and sprinkler fitters –made up 6% of injured construction workers treated at the George Washington University Emergency Department during the seven-year study. Of the 176 injured pipe trades workers, 158 were plumbers or pipefitters and 18 were sprinkler fitters.

Demographic Characteristics: The age range and average age, 35, of the injured pipe trades workers was similar to the age range of all workers. Injured workers from this trade were more likely to be white and less likely to be black or Hispanic than in all other trades; 61% of plumbers and sprinkler fitters were white, compared to 45% for construction workers from other trades. Among injured plumbers and sprinkler fitters, 2.3% were female, comparable to the 3.2% female representation among other workers.

Causes of Injury, Diagnoses, and Body Locations (charts 5-A through 5-E): Injuries for this trade differed in a number of respects from injuries seen among other construction workers. For instance, eye injuries accounted for one in five visits by pipe trades workers to the emergency room, about twice the percentage seen for all other workers and higher than for all other trades except welders. Injury by an object in the eye, which accounts for most eye injuries, was twice as frequent in this group as for all other workers. Eye splashes from chemicals such as PVC primer, trichloroethane, and hydraulic fluid led the list, but eye injuries resulted also from a variety of other materials: paint, soldering or welding debris, grinding dust, and concrete (wet or chips). Toxic exposures resulted from a variety of

Recommendations: Plumbing work involves several types of tasks that are risky for eye injuries: working overhead around ceiling tiles and insulation, working with chemicals, working with pressurized systems, grinding and cutting pipes, and soldering. Although some of these hazards may be reduced through engineering controls, safety glasses and goggles are probably the most practical solution. Since there are so many risky tasks and environments, universal use of eye protection would be a reasonable policy. Certainly, workers should understand which activities put them at greatest risk. Contractors should make it a priority to identify comfortable and appropriate protective eyewear, and should develop policies that encourage workers to use this eyewear.

Pipe trades workers are injured particularly often by heavy materials that strike against or fall onto workers' hands or heads. Pipes are involved in many of these injuries. Pipes are often hard to handle because they can be long and heavy –plus they roll. They al so cast a wide swath when they swing. There are specific material-moving devices and techniques that contractors could introduce and workers could use to make injury from pipes less likely. Improved material-handling practices will also help to prevent back injuries. Glove use could help also to prevent lacerations, crushes, and fractures when materials do fall or shift.

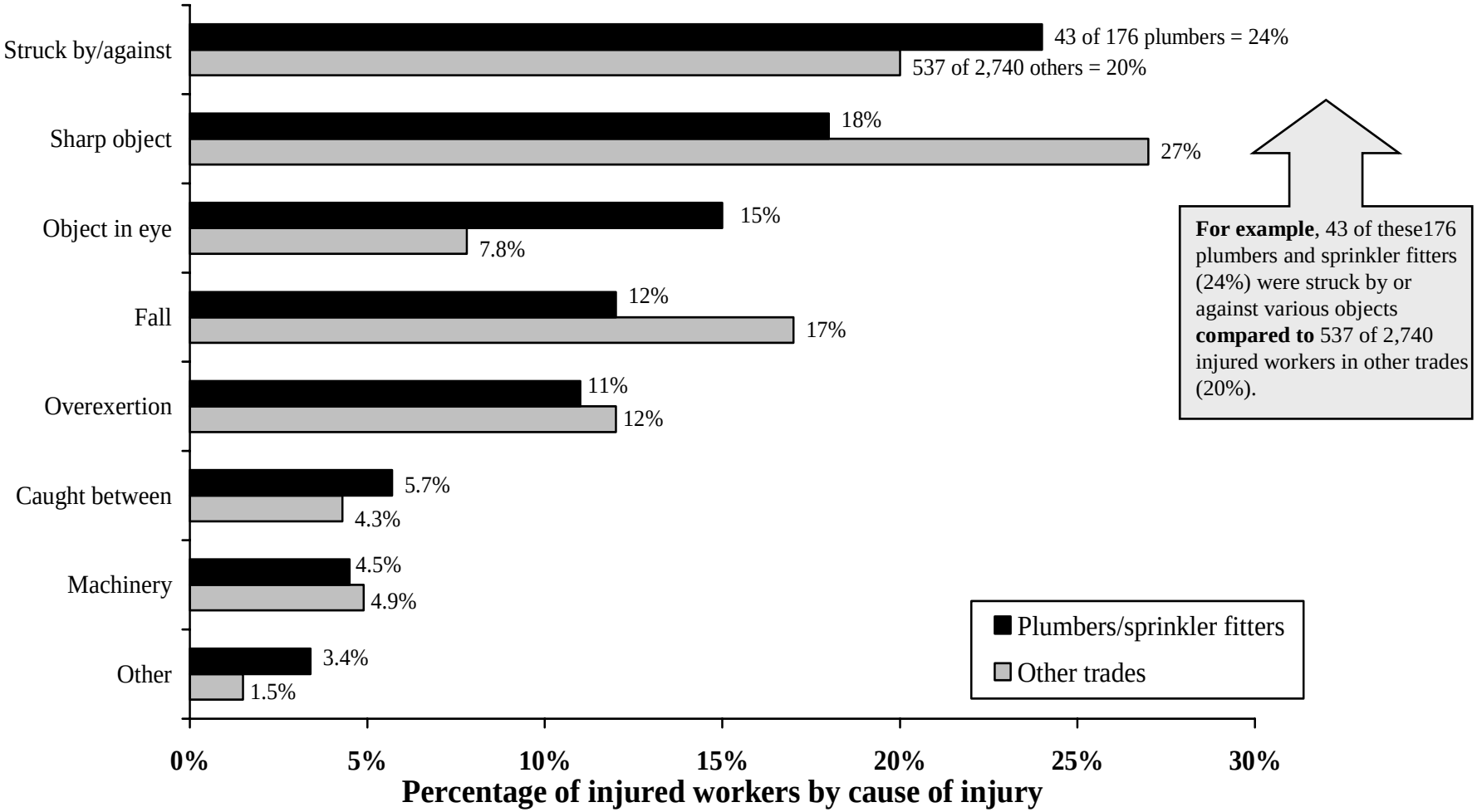
Plumbers and sprinkler fitters often work in tight spaces where materials aren't secured over their heads, and must use considerable force to loosen and connect fittings. Such work puts a strain on the neck, shoulders, and low back. The problem occurs throughout new construction, renovation, demolition, and maintenance work

Chart 5-A

176 injured plumbers and sprinkler fitters

Causes of injury

Compared to 2,740 other injured construction workers



GWU Emergency Department injury data, 11/90-10/97

Chart 5-B

176 injured plumbers and sprinkler fitters

Detailed causes of injury

RANK #2	18%
SHARP OBJECT	32

me

Chart 5-C

176 injured plumbers and sprinkler fitters treated for 195 diagnoses

Injury diagnoses

Compared to 2,740 other construction workers treated for 3,012 diagnoses

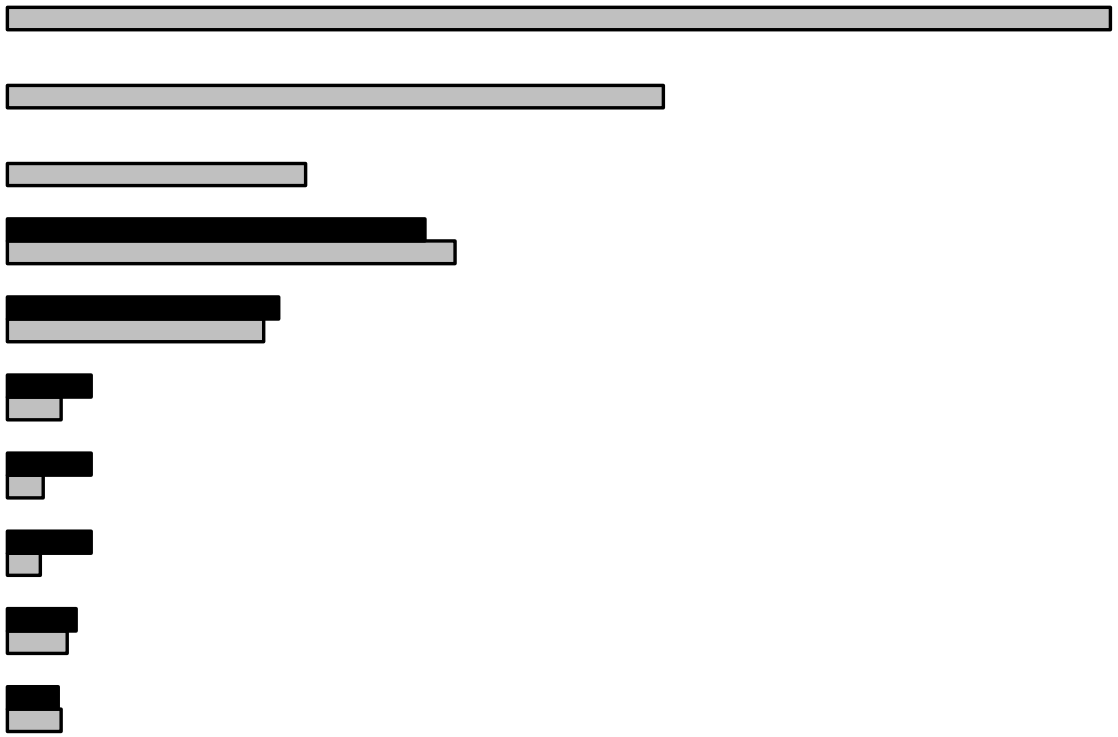
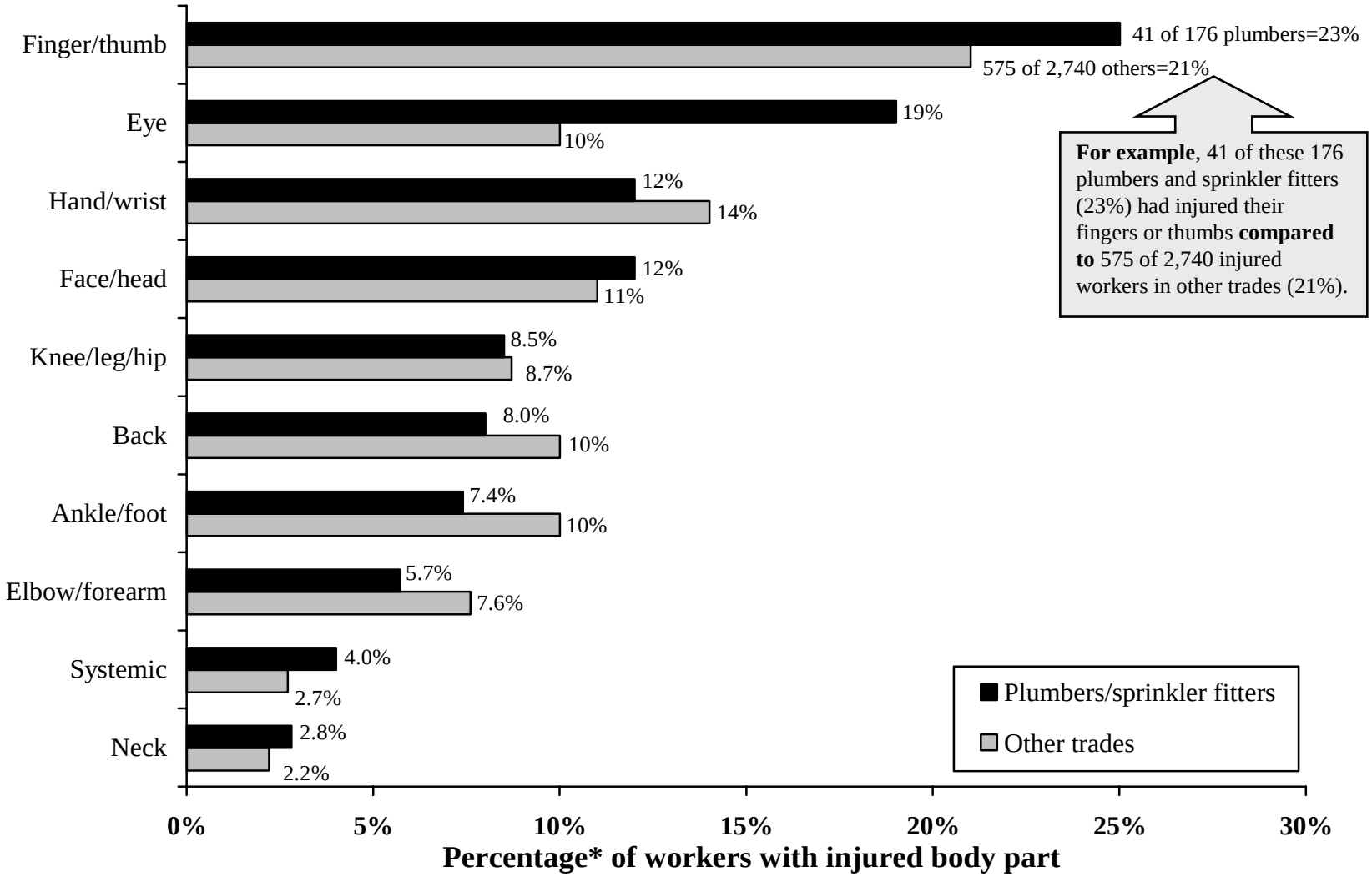


Chart 5-D

176 plumbers and sprinkler fitters treated for 195 diagnoses

Injured body parts

Compared to 2,740 other construction workers treated for 3,012 diagnoses



*Note: Percents add to more than 100 because some injured workers had more than one diagnosis/body part.

GWU Emergency Department injury data, 11/90-10/97

Chart 5-E

176 injured plumbers and sprinkler fitters treated for 195 diagnoses

Diagnoses by body part

RANK #1	**29% ***
LACERATION	**51 ****
finger/thumb	19
face/head	13
hand/wrist	9
elbow/forearm	7
ankle/foot	2
knee/leg/hip	1

RANK #2	**23%**
SPRAIN, STRAIN, PAIN	**41**
back	11
knee/leg/hip	7
ankle/foot	6
neck	5
shoulder/upper arm	4
hand/wrist	3
elbow/forearm	3
finger/thumb	3

RANK #3	**19%**
EYE INJURIES	**33**

RANK #4	**14%**
CONTUSION, ABRASION, FOREIGN OBJECT (excl. eye)	**24**
knee/leg/hip	4
hand/wrist	4
face/head	4
finger/thumb	4
back	3
trunk	2
ankle/foot	2
shoulder/upper arm	1
multiple	1

RANK #5	**9.1%**
FRACTURES	**16**
finger/thumb	8
hand/wrist	2
trunk	2
knee/leg/hip	2
ankle/foot	2

For example:

* Percentage of plumbers with one or more lacerations. Percents add to more than 100 because some injured workers had more than one diagnosis.

** Number of plumbers with one or more lacerations.

Supervisors and Foremen

FROM November 1, 1990 to October 31, 1997, 152 construction supervisors were treated for work-related injuries at the George Washington University Emergency Department. Job titles that are classified into this category include both general and trade-specific foremen, supervisors, inspectors, engineers, managers, contractors, and superintendents. (Self-employed contractors who specified a trade are included with that group.) Such diversity in the job titles suggests that their tasks (and associated hazards) were also diverse. There is more opportunity for job title misclassification among supervisors than in other occupational groups; for example, an electrical supervisor may describe him- or herself as an electrician or as a supervisor. Also, depending on whether a supervisor works alongside his or her crew, the hazards encountered may be more or less similar to those of the trade being supervised. The injury

In the case of eye injuries, the supervisors sometimes reported that they were creating the hazard (for example, one sheet metal foreman was welding and got slag in his eye)

Chart 6-A

152 injured supervisors and foremen

Causes of injury

Compared to 2,764 injured in other construction occupations

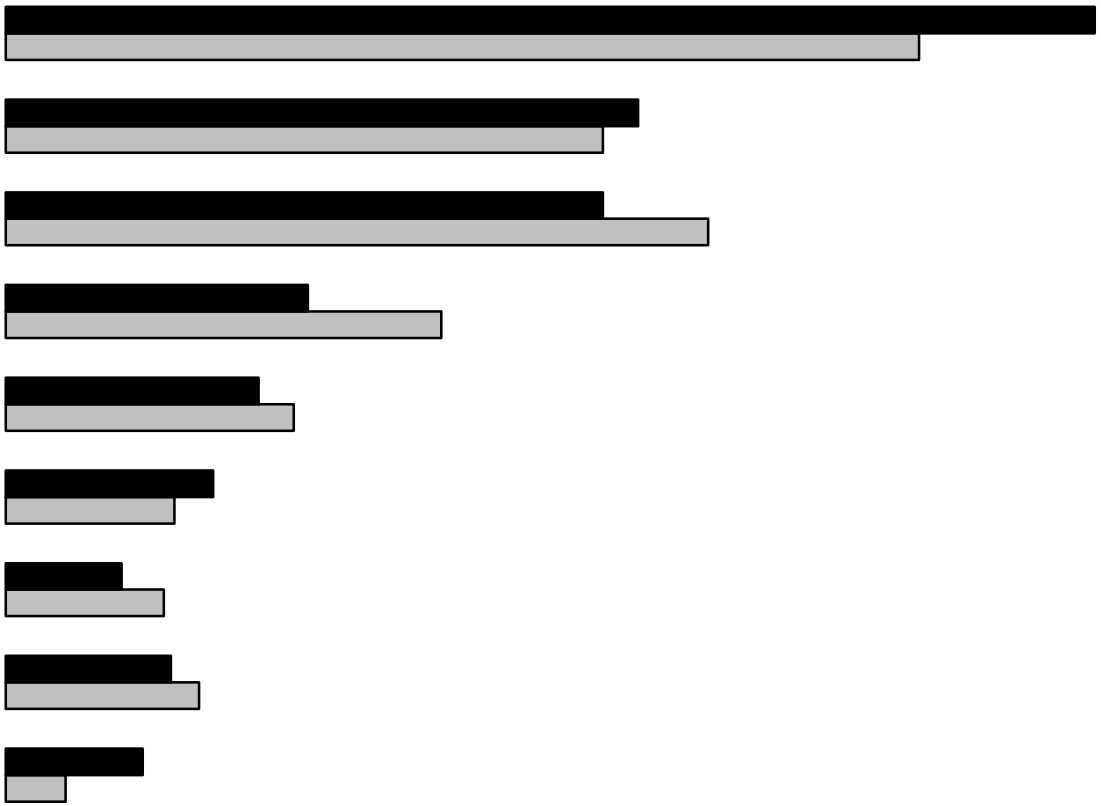


Chart 6-B

152 injured supervisors and foremen

Detailed causes of injury

RANK #1	31%
SHARP OBJECT	**47**
metal/sheetmetal/ductwork	15
razor/knife	7
power tool, incl. power saw(2)	6
glass	5
light fixture	3
rebar/metal bar/metal stud	2
wire	2
hand tool	2
other	4
not specified	1

RANK #2	18%
FALL	**28**
from ladder	8
slip/trip/stumble	5
from stairs	4
from scaffold	3
from another level	3
not specified	3
into a hole	2

RANK #3	17%
STRUCK BY/AGAINST OBJECT (INCL. FALLING OBJECT)	**26**
piece of metal/sheetmetal/duct	3
metal object	3
ceiling/wall	3
pipe	2
hammer/sledge	2
beam	2
cinder block/brick/stone	1
drywall/plaster	1
concrete/cement	1
other	7
not specified	1

RANK #4	9%
OVEREXERTION / STRENUOUS MOVEMENT	**13**
lifting/carrying	4
stepping on/off, walking	3
pushing/pulling	1
using jackhammer	1
bending over	1
other: using nail gun	1
not specified	2

RANK #5	7%
OBJECT IN EYE	**11**
concrete/cement (dust or wet)	4
wood dust	3
dirt/dust/debris	1
rock/stone/gravel	1
metal dust	1
not specifec9.7( )-1819.3( )-3364.5( )-3361.5(	

1CT)8.2( )]TJ /F2 1 T-169 -180007 TD 3.3645 Tc 0 Tw [( )]TJ 3.8675 0 T

Chart 6-C

152 injured supervisors and foremen treated for 167 diagnoses

Injury diagnoses

Chart 6-E

152 injured supervisors and foremen treated for 167 diagnoses

Diagnoses by body part

RANK #2	20%
SPRAIN, STRAIN, PAIN	**31**
low back	8
knee/leg/hip	6
ankle/foot	5
hand/wrist	5
n	

Ironworkers

FROM November 1, 1990 through October 31, 1997, 133 construction workers who identified themselves as ironworkers, reinforced ironworkers, rodmen, or steelworkers were treated for work-related injuries at the George Washington University Emergency Department. This group of workers is referred to as ironworkers in this section.

Demographic Characteristics: The average age of the ironworkers was 39, which was four years older than the average age of workers in all other trades. The youngest injured ironworker was 18 and the oldest was 62. Injured ironworkers were most likely to be white (65%), and only 4% were Hispanic. Also, only one of the injured ironworkers was a woman, compared to the 3.3% female representation among injured workers in all other trades.

Causes of Injury, Diagnoses, and Body Locations (charts 7-A through 7-E): Injuries for this trade differed in some respects from injuries seen among other construction workers.

Most commonly, ironworkers were treated in the Emergency Department after they struck against or were struck by various objects (23%). Not surprisingly, a leading cause of such injuries was rebar, steel bars used to reinforce concrete. For example, one ironworker was cutting rebar when a piece snapped up and struck him in the face; another had a 400-pound steel Bar fall onto his fingers. A variety of other tools and materials fell and struck ironworkers from above. For example, one ironworker was trapped under a collapsed metal beam; another had a brick fall from 2 stories above, onto his head. One was hit by a 70-pound drill attached to a rope that swung and hit him in back; another had a railing fall on his hand, crushing his middle finger. The fact that ironworkers are laying out the structural framework of the building, and initially laying out rebar at ground level may explain the number of injuries due to being struck from above by falling objects.

Even though few of the falls were from a height, some of them were very serious. Nationwide, ironworkers are often injured in falls from height, and ironworkers have proportionally more deaths from falls than any other construction trade. The fact that the majority of the falling injuries here were a result of slipping or tripping reflects the fact that concrete construction predominates in Washington, D.C., and most local ironworkers are rodmen. Rodmen work on the same level with horizontal rebar or at modest elevations with vertical rebar, rather than at the heights seen in structural ironwork.

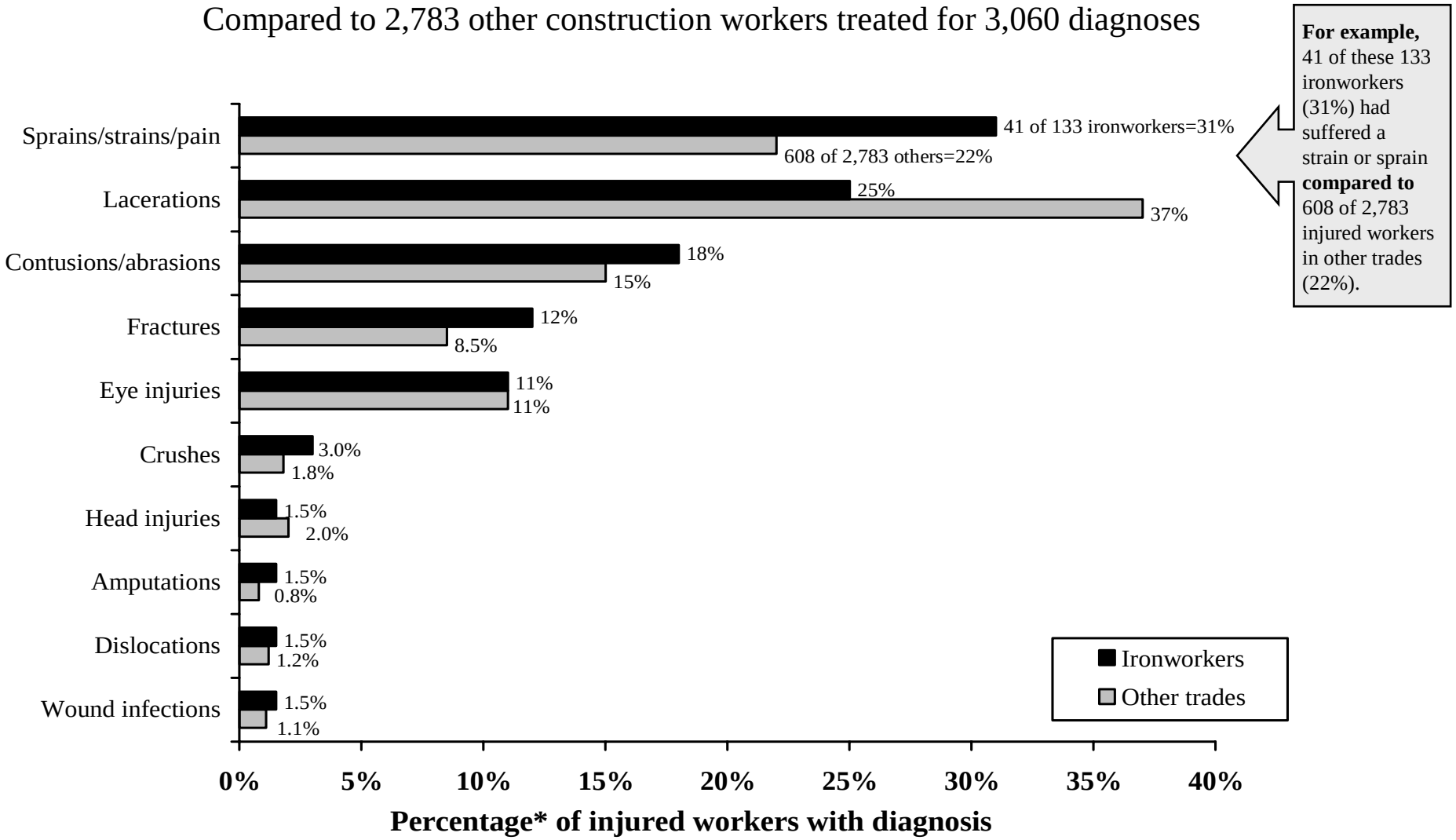
Hospital Admissions: Seven of these 133 ironworkers were hospitalized, and one died from multiple injuries after falling 11 stories onto a stack of windows. Apparently, he had temporarily unhooked his safety line to step around the outside edge of a column. Four other ironworkers were hospitalized after falls: One fell 30 to 60 feet from an elevated highway construction site and suffered a spinal

Chart 7-C

133 injured ironworkers treated for 147 diagnoses

Injury diagnoses

Compared to 2,783 other construction workers treated for 3,060 diagnoses



For example, 41 of these 133 ironworkers (31%) had suffered a strain or sprain **compared to** 608 of 2,783 injured workers in other trades (22%).

*Note: Percents add to more than 100 because some injured workers had more than one diagnosis.

Chart 7-D

133 injured ironworkers treated for 147 diagnoses

Injured body parts

Compared to 2,783 other construction workers treated for 3,060 diagnoses

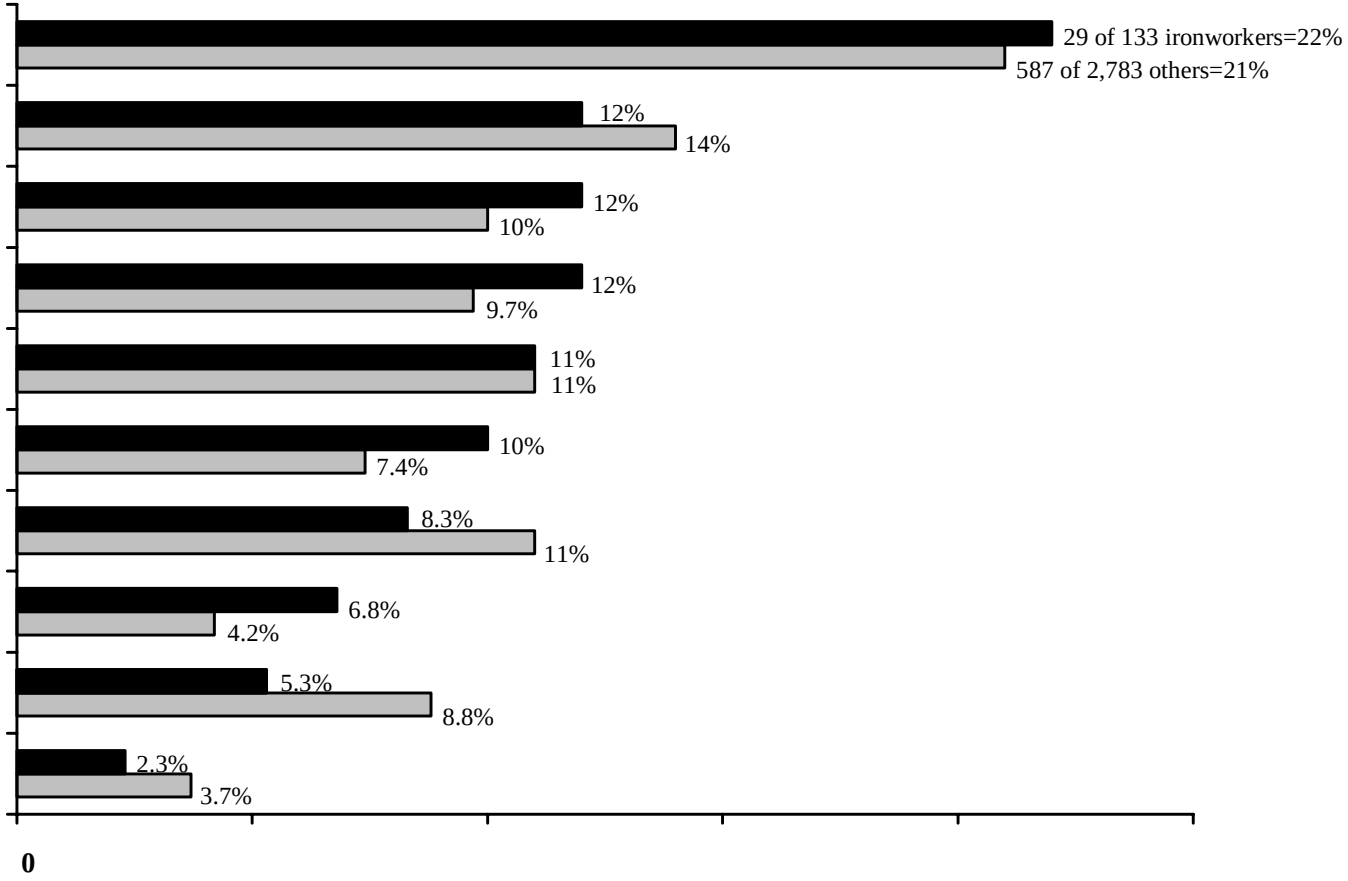


Chart 7-E

133 injured ironworkers treated for 147 diagnoses

Diagnoses by body part

RANK #1	**31% ***
SPRAIN, STRAIN, PAIN	**41****
low back	14
ankle/foot	9
hand/wrist	6
shoulder/upper arm	3
elbow/forearm	3
trunk	2
neck	2
upper back	1
finger/thumb	1

RANK #2	**25%**
LACERATION	**33**
finger/thumb	8
face/head	7
hand/wrist	7
elbow/forearm	5
knee/leg/hip	4
ankle/foot	2

RANK #3	**18%**
CONTUSION, ABRASION, FOREIGN OBJECT (excl. eye)	**24**
finger/thumb	12
shoulder/upper arm	3
hand/wrist	3
elbow/forearm	2
knee/leg/hip	1
face/head	1
ankle/foot	1
back	1

RANK #4	**12%**
FRACTURE	**16**
finger/thumb	6
ankle/foot	3
elbow/forearm	2
trunk	1
shoulder/upper arm	1
knee/leg/hip	1
face/head	1
hand/wrist	1

For example:

* Percentage of ironworkers with one or more sprains or strains. Percents add to more than 100 because some injured workers had

Painters and Glaziers

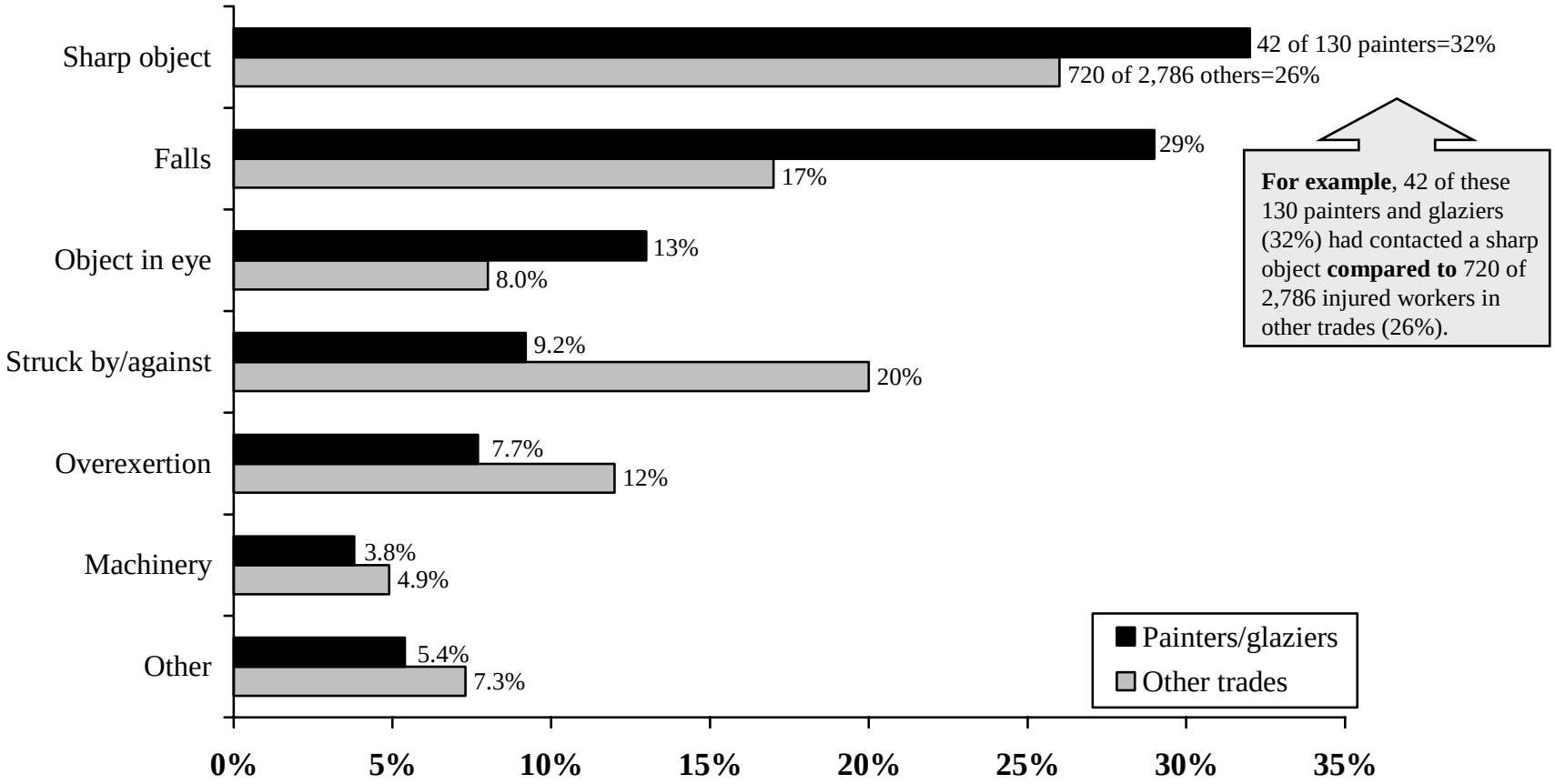
OVER SEVEN YEARS

Chart 8-A

130 injured painters & glaziers

Causes of injury

Compared to 2,786 other injured construction workers



Percentage of injured workers by cause of injury

GWU Emergency Department injury data, 11/90-10/97

Chart 8-B

130 injured painters & glaziers

Detailed causes of injury

RANK #1	32%
SHARP OBJECT	**42**
razor/knife	17

no

razoot2(e3)r:2.1(w)26.9(23)dusf 17

RANK #2	29%
FALL	**37**
from ladder	21
from scaffold	7
from another level	5
from stairs	3
not specified	1

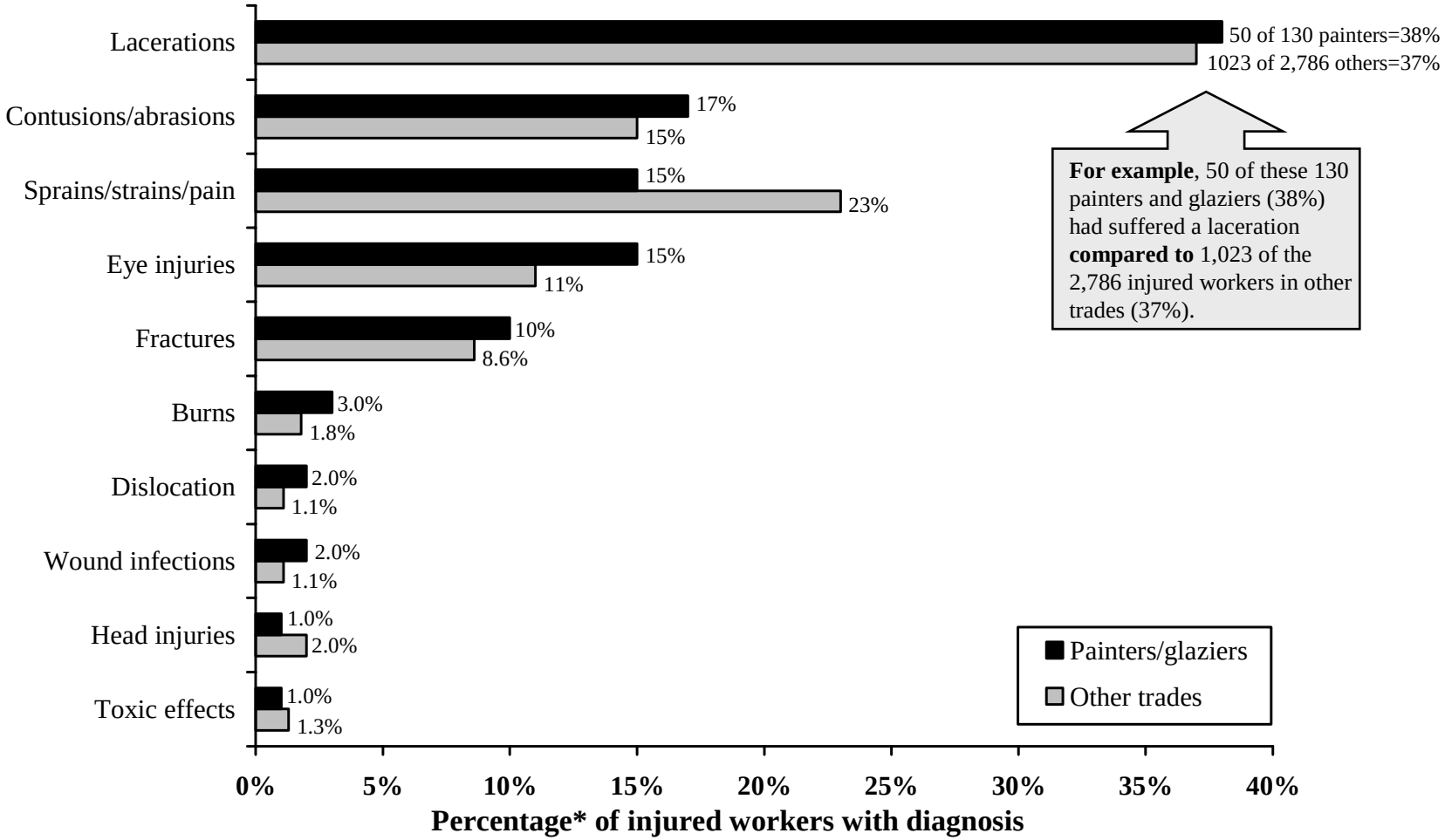
RANK #3	13%
OBJECT IN EYE	**17**
paint (dust or wet)	5
chemical	3
dirt/dust/debris	2
metal dust	2
rock/stone/gravel	1
concrete/cement	1
ceiling tile	1
not specified	2

Chart 8-C

130 injured painters & glaziers treated for 143 diagnoses

Injury diagnoses

Compared to 2,786 other injured construction workers treated for 3,064 diagnoses



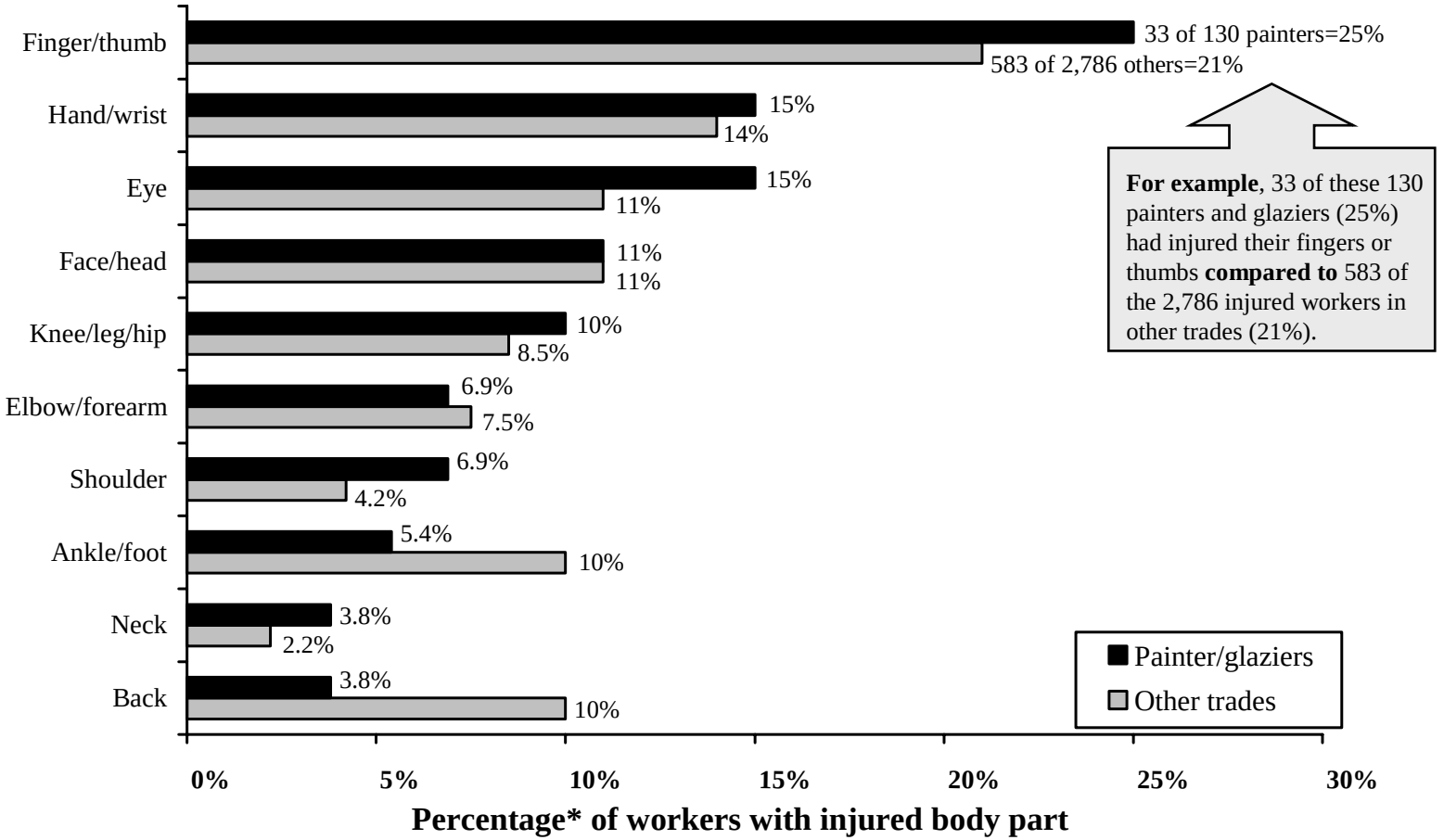
*Note: Percents add to more than 100 because some injured workers had more than one diagnosis.

Chart 8-D

130 injured painters & glaziers treated for 143 diagnoses

Injured body parts

Compared to 2,786 other injured construction workers treated for 3,064 diagnoses



*Note: Percents add to more than 100 because some injured workers had more than one diagnosis/injured body part.

Chart 8-E

130 injured painters & glaziers treated for 143 diagnoses

Diagnoses by body part

RANK #1	38% *
LACERATION	**50 ****
finger/thumb	24
hand/wrist	14
face/head	6
elbow/forearm	4
knee/leg/hip	2
shoulder/upper arm	1
ankle/foot	1

RANK #2	17%
CONTUSION, ABRASION, FOREIGN OBJECT (excl. eye)	**22**
knee/leg/hip	6
face/head	6
finger/thumb	3
hand/wrist	2
shoulder/upper arm	2
back	2
trunk	1
neck	1
ankle/foot	1
elbow/forearm	1
multiple	1

RANK #3	15%
SPRAIN, STRAIN, PAIN	**20**
neck	4
shoulder/upper arm	3
low back	3
knee/leg/hip	3
ankle/foot	3
hand/wrist	2
finger/thumb	1
elbow/forearm	1

Brick, Stone, and Concrete Masons

FROM November 1, 1990 to October 31, 1997, 106 construction workers who identified themselves as masons were treated for work-

If mechanical lifting aids are not available, the buddy system should be used whenever possible. A "healthy back" class might r aise awareness. In addition, the weight of each object could be reduced. For example, concrete should be made available in smaller bags, and lightweight concrete block could be substituted.

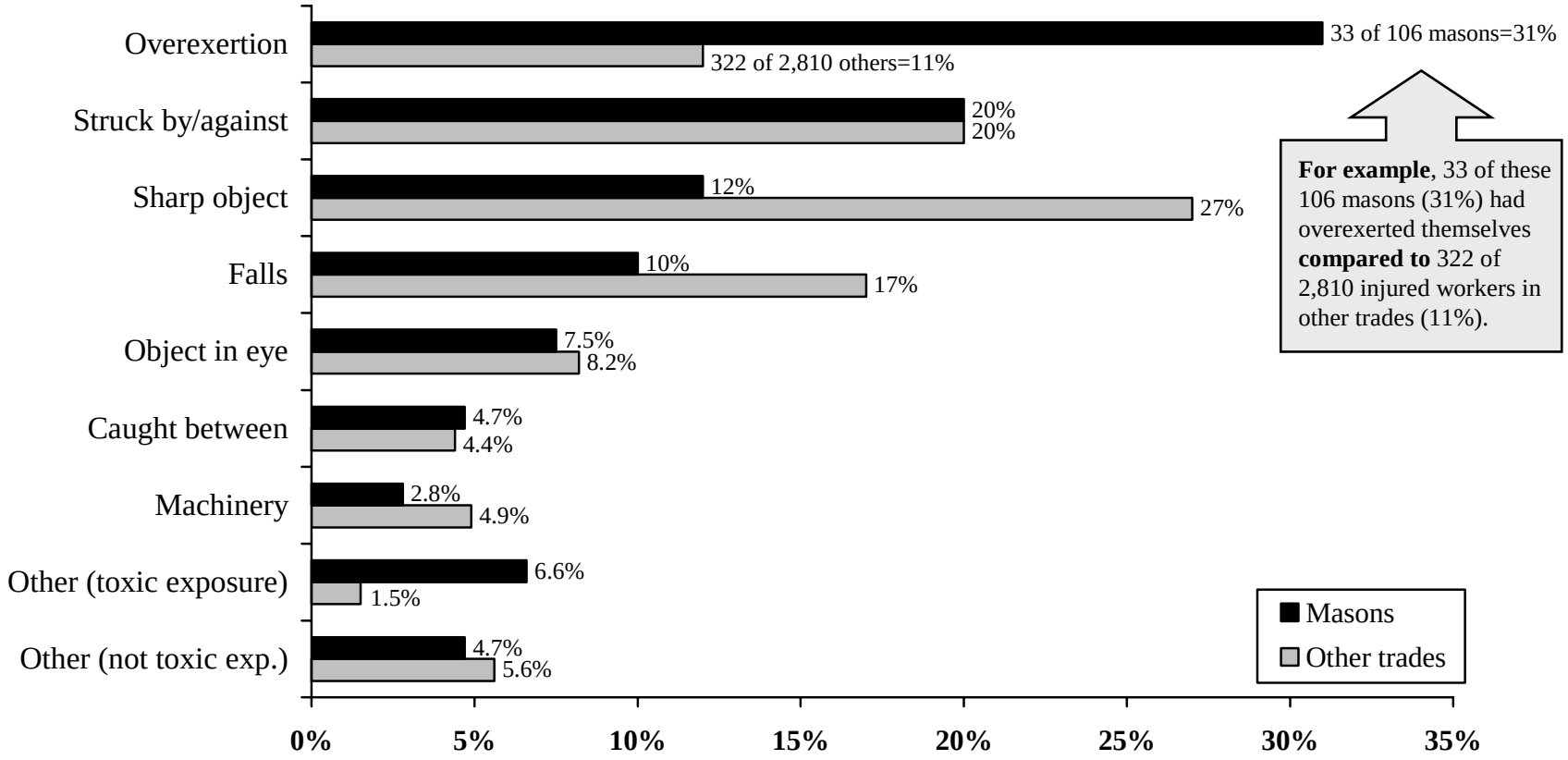
Finally, the scaffold injuries suggest the need for comprehensive scaffold safety programs that include the installation of adequate guardrails and the use of fall protection. The carbon monoxide poisonings (although few) act as a reminder of the importance of proper safety procedures.

Chart 9-A

106 injured brick, stone, & concrete masons

Causes of injury

Compared to 2,810 other injured construction workers



Percentage of injured workers by cause of injury

Chart 9-B

106 injured brick, stone, & concrete masons

Detailed causes of injury

RANK #2	20%
STRUCK BY/AGAINST OBJECT (INCL. FALLING OBJECT)	**21**
granite/marble/stone	4
concrete/cement	3
scaffold	2
pipe	2
board/wood	2
metal: object, plate	2
hammer/sledge	2
wrench	1

Chart 9-C

106 brick, stone, & concrete masons treated for 117 diagnoses

Injury diagnoses

Compared to 2,810 other construction workers treated for 3,090 diagnoses

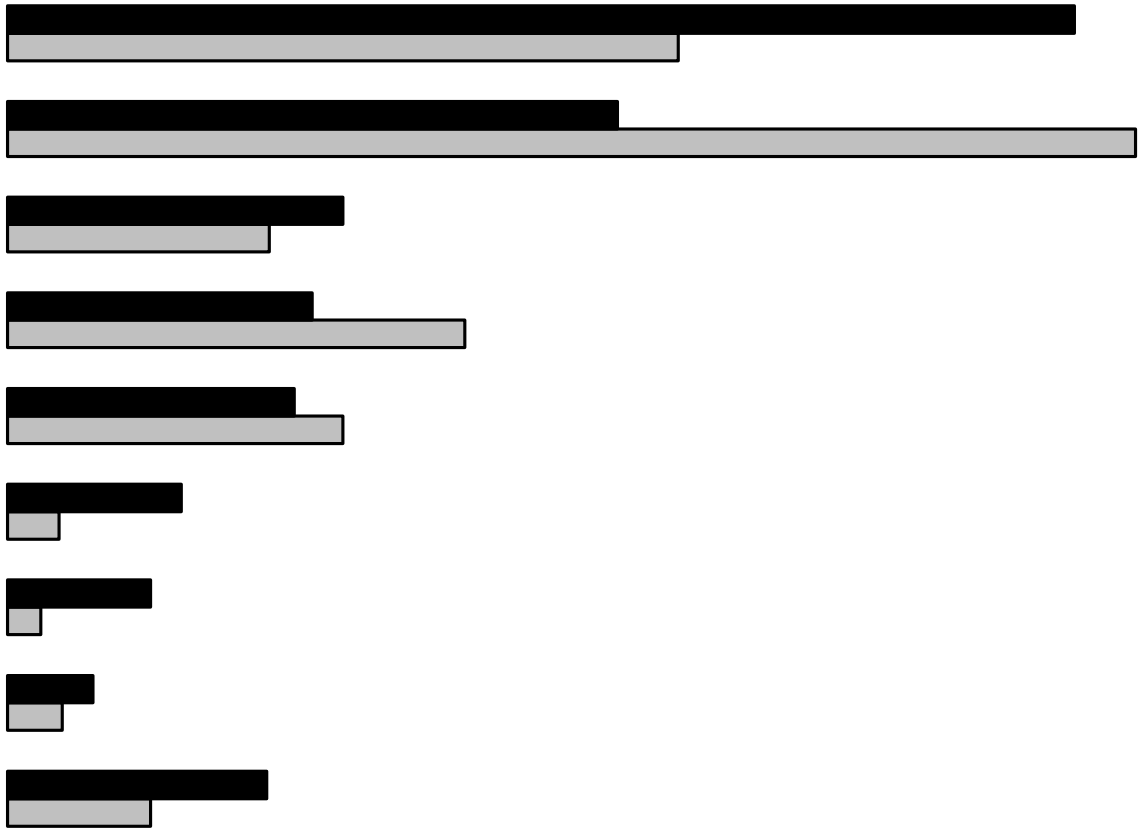


Chart 9-E

Diagnoses by body part

RANK #1	35% *
SPRAIN, STRAIN, PAIN	**37****
low back	13
knee/leg/hip	5
upper back	4
shoulder/upper arm	4
neck	4
ankle/foot	3
finger/thumb	3
trunk	1
elbow/forearm	1

RANK #2	20%
LACERATION	**21**
face/head	8
hand/wrist	6
ankle/foot	3
finger/thumb	3
elbow/forearm	2

RANK #3	11%
FRACTURE	**12**
finger/thumb	5
ankle/foot	3
trunk	2
hand/wrist	1
elbow/forearm	1

RANK #4	10%
CONTUSION, ABRASION, FOREIGN OBJECT (excl. eye)	**11**
ankle/foot	3
shoulder/upper arm	2
knee/leg/hip	2
face/head	2
hand/wrist	1
finger/thumb	1
elbow/forearm	1

For example:
* Percentage of masons with one or more strains, sprains, or feeling of pain. Percents add to more than 100
be3e9 -1731.1(. P)64**f**. l. l. (w)6(r)-

Sheet Metal Workers

IN SEVEN YEARS, 92 injured sheet metal workers were seen at the George Washington University Emergency Department. Sheet metal workers were 3.2% of all injured construction workers. The number of injuries is small for statistical purposes and readers should use caution in drawing conclusions from these 92 cases. Sheet metal workers generally fabricate duct in shop settings or install duct on construction sites; workers from both types of settings were included in this study. In addition, this category included two individuals who described themselves as HVAC mechanics or technicians.

Demographic Characteristics: The age range of sheet metal workers was similar to the age range of other injured workers, and the proportion of injured female workers (2.2%) was also roughly comparable. Seventy-three percent of the injured sheet metal workers were white, compared to 45% of all other construction workers.

Causes of Injury, Diagnoses, and Body Locations (charts 10-A through 10-E)

Chart 10-A

92 injured sheet metal workers

Causes of injury

Compared to 2,824 other injured construction workers

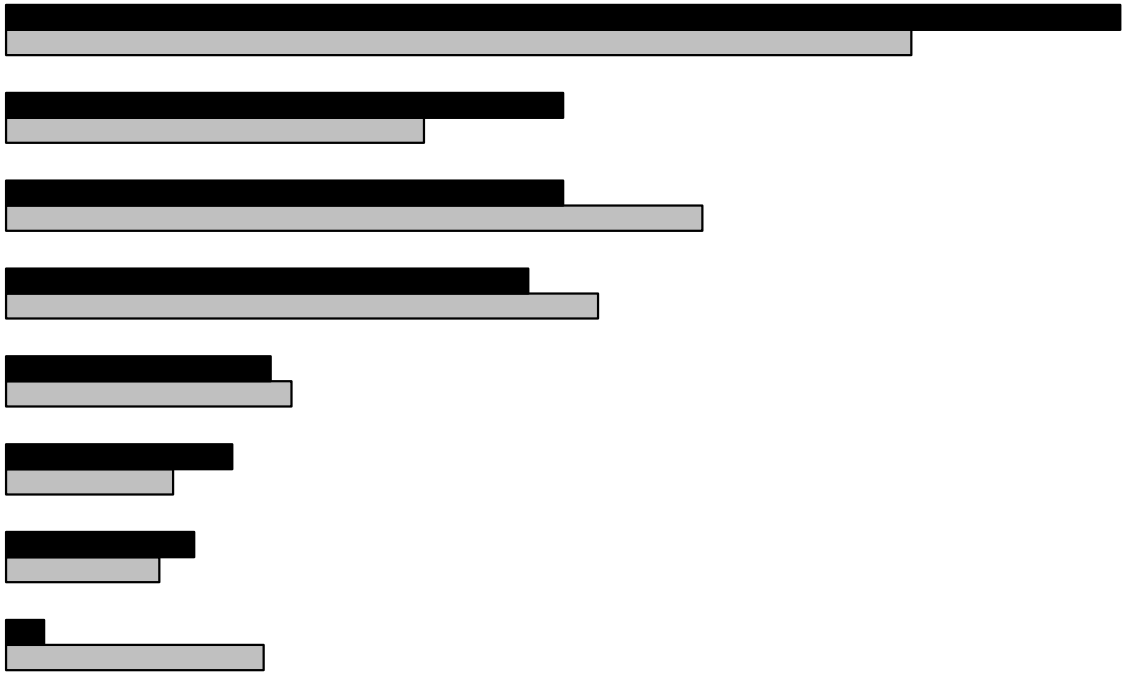


Chart 10-B

92 injured sheet metal workers

Detailed causes of injury

RANK #1	32%
SHARP OBJECT	**29**
metal/sheetmetal/duct	21
hand tool	3
nail	2
razor/knife	1
other: metal fan	1
not specified	1

RANK #2/3 (tie)	16%
OVEREXERTION/ STRENUOUS MOVEMENT	**15**
lifting/carrying	5
stepping on/off, walking	2
stopping a fall/falling obj.	1
pushing/pulling	1
overhead	1
other:	
riding forklift, drilling	2
not specified	3

RANK #2/3 (tie)	16%
STRUCK BY/AGAINST OBJECT (INCL. FALLING OBJECT)	**15**
metal/sheetmetal/duct	6
hammer/sledge	3
truck	1
pipe	1
light fixture	1
other	3

RANK #4	15%
FALLS	**14**
from ladder	5
from stairs	2
slip/trip/stumble	2
out of building/structure	2
from scaffold	1
not specified	2

RANK #5	7.6%
OBJECT IN EYE	**7**
rock/stone/gravel	1
metal dust	1
dirt/dust/debris	1
concrete/cement	1
other: charcoal dust	1
not specified	2

RANK #6	6.5%
MACHINERY RELATED	**6**
lifting machinery	2
metal working machinery	1
other: welding machine	1
grinder (type not specified)	1
not specified	1

Chart 10-C

92 injured sheet metal workers treated for 99 diagnoses

Injury diagnoses

Compared to 2,824 other injured construction workers treated for 3,109 diagnoses

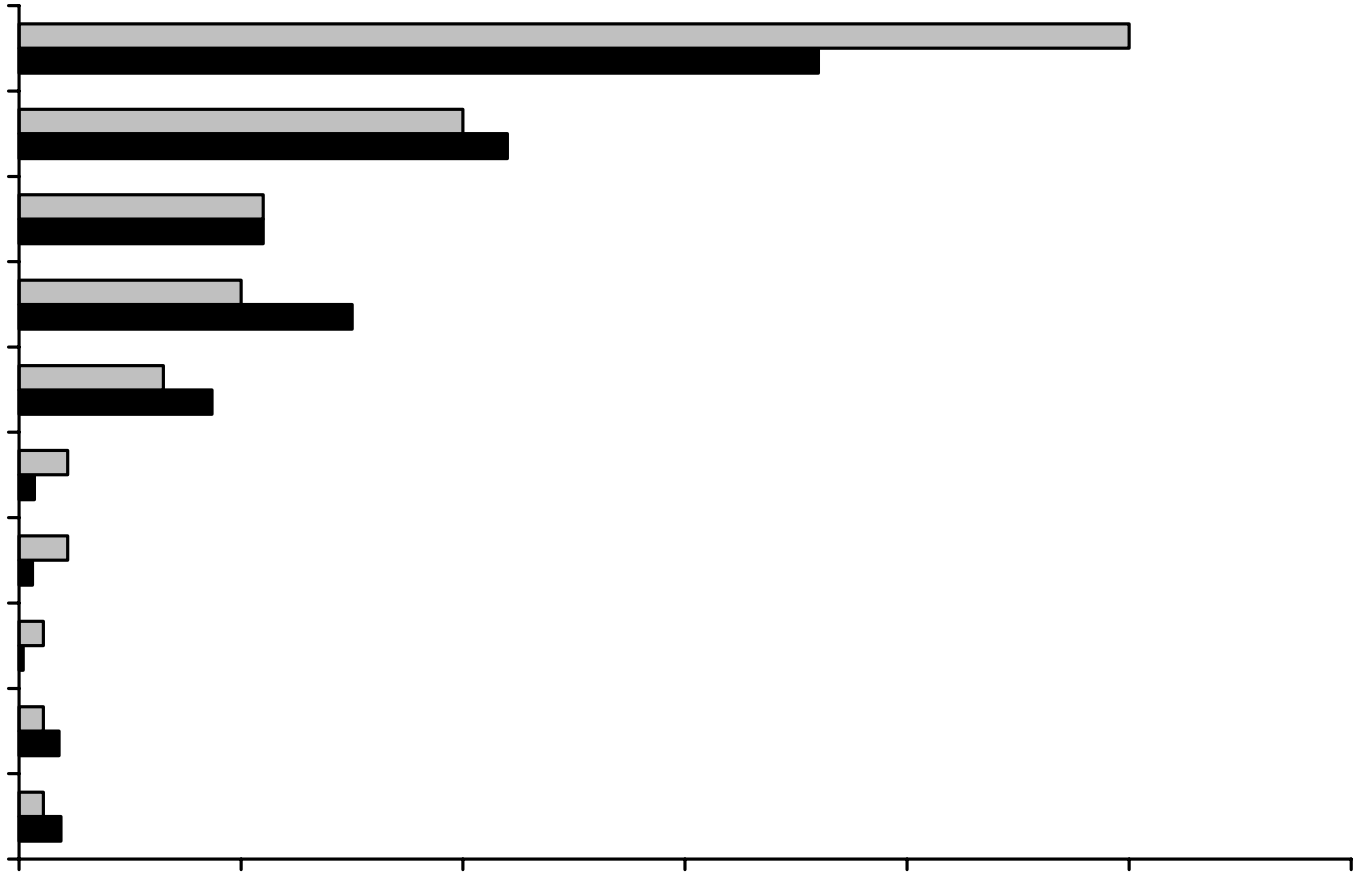


Exhibit Technicians

FROM November 1, 1990 through October 31, 1997, 76 workers who were employed as exhibit technicians were treated for work-related injuries at the George Washington University Hospital Emergency Department. They identified themselves as carpenters, exhibit technicians, exhibit carpenters, or trade show decorators. For this analysis, the name of their employer was used to distinguish them from carpenters who work on traditional construction jobs or maintenance jobs. (The injuries of carpenters who do not construct or install exhibit booths are characterized in a separate section.)

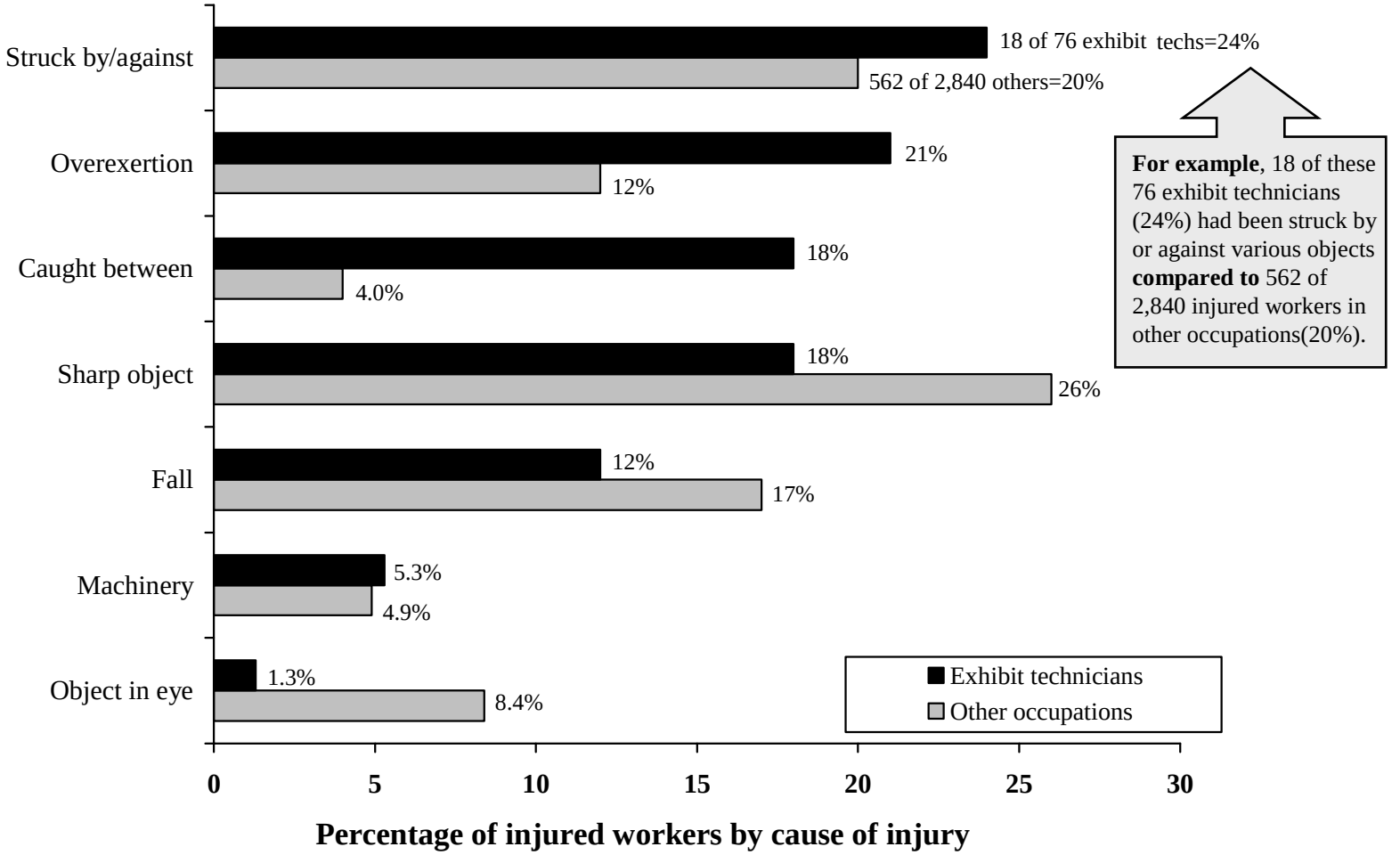
The demand for exhibit technic

Chart 11-A

76 injured exhibit technicians

Causes of injury

Compared to 2,840 other injured workers



For example, 18 of these 76 exhibit technicians (24%) had been struck by or against various objects **compared to** 562 of 2,840 injured workers in other occupations(20%).

Chart 11-B
76 injured exhibit technicians
Detailed causes of injury

RANK #1	24%
STRUCK BY/AGAINST OBJECT (INCL. FALLING OBJECT)	**18**
board/wood	3
table	2
pipe	2
box/crate/toolbox	2
metal: plate, rebar, metal bar	2
scaffold	1
drill	1
ceiling/wall	1
cart/dolly	1
other	3

RANK #2	21%
OVEREXERTION / STRENUOUS MOVEMENT	**16**
lifting/carrying	9
pushing/pulling	3
stepping on/off, walking	1
bending over	1
other: lowering object into crate	1
not specified	1

RANK #3/4 (tie)	18%
CAUGHT BETWEEN OBJECTS	**14**
involving cart/dolly	8
involving metal plate/object	2
involving door	2
involving board/wood	1
involving beam	1

RANK #3/4 (tie)	18%
SHARP OBJECT	**14**
razor/knife	6
nail	3
hand tool	2
wire	1
metal/sheetmetal	1
glass	1

RANK #5	12%
FALL	**9**
slip/trip/stumble	3
from ladder	3
from another level	1
from scaffold	1
not specified	1

RANK #6	5%
MACHINERY RELATED	**4**
lifting machinery	3

Chart 11-C

76 injured exhibit technicians treated for 80 diagnoses

Injury diagnoses

Compared to 2,840 other injured workers treated for 3,127 diagnoses

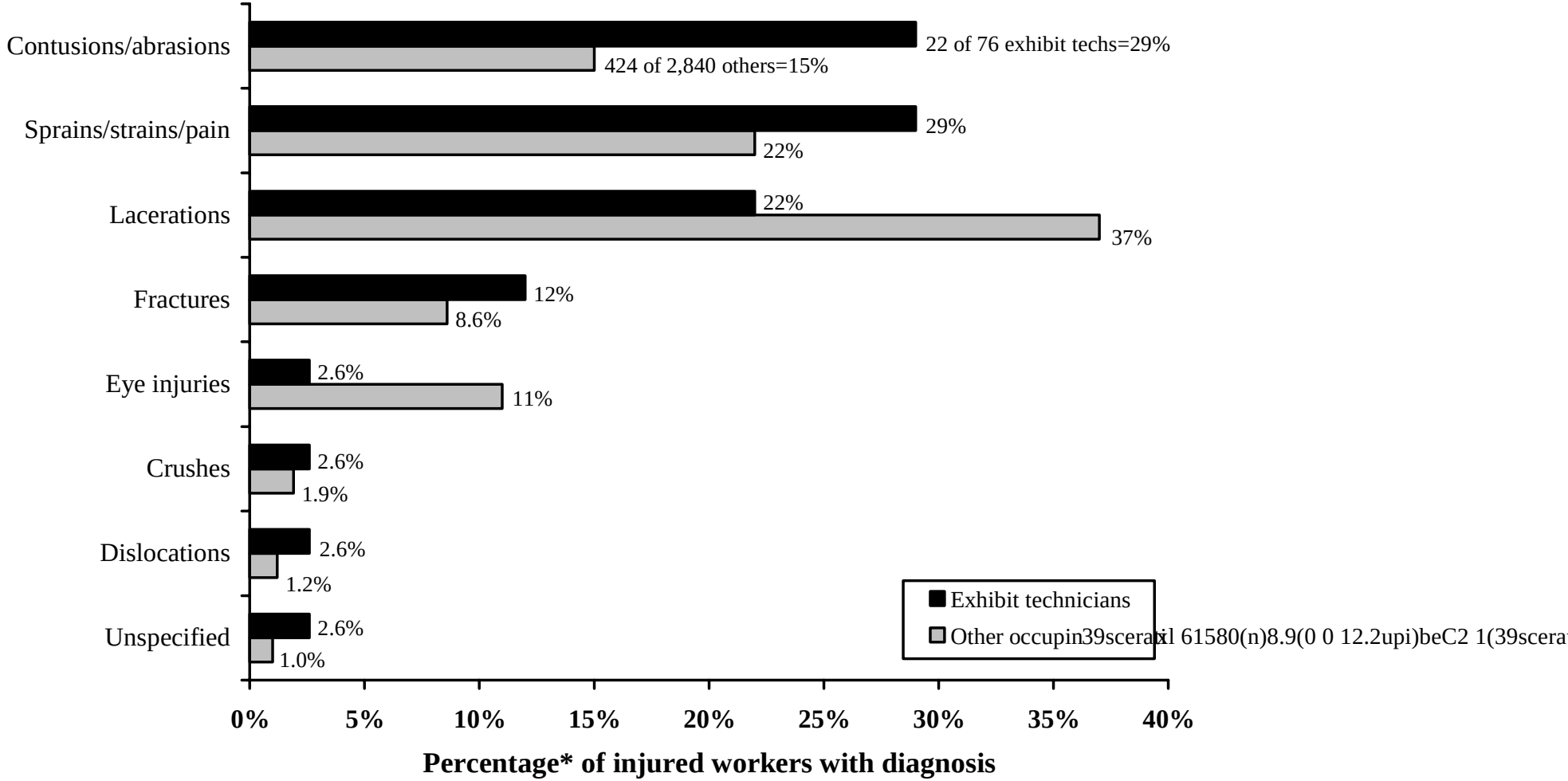
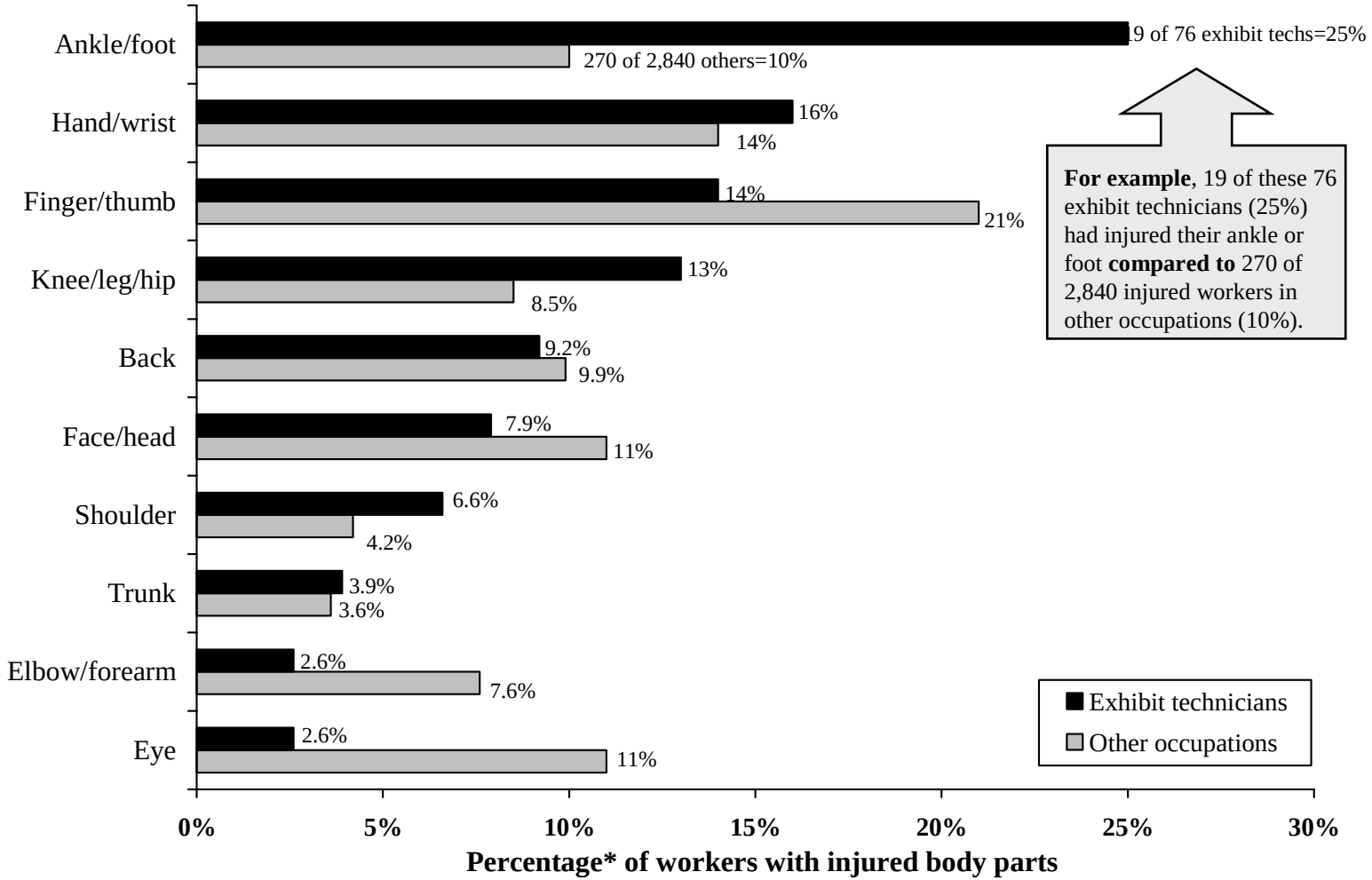


Chart 11-D

76 injured exhibit technicians treated for 80 diagnoses

Injured body parts

Compared to 2,840 other injured workers treated for 3,127 diagnoses



*Note: Percents add to more than 100 because some injured workers had more than one diagnosis/injured body part.

Chart 11-E

76 injured exhibit technicians treated for 80 diagnoses

Diagnoses by body part

RANK #1/2 (tie)	29% *
CONTUSION,ABRASION, FOREIGN OBJECT (excl. eye)	**22****
knee/leg/hip	4
hand/wrist	4
ankle/foot	4
face/head	3
shoulder/upper arm	2
back	2
elbow/forearm	2
trunk	1
finger/thumb	1

RANK #1/2 (tie)	29%
SPRAIN, STRAIN, PAIN	**22**
ankle/foot	6
low back	5
knee/leg/hip	3
shoulder/upper arm	2
neck	2
hand/wrist	2
finger/thumb	2
trunk	1

RANK #3	22%
LACERATION	**17**
finger/thumb	5
hand/wrist	4
face/head	3
ankle/foot	3
knee/leg/hip	2

RANK #4	12%
FRACTURES	**9**
ankle/foot	6
trunk	1
hand/wrist	

Chart 12-B

66 injured drywall and plaster workers

Detailed causes of injury

RANK #1	35%
FALL	**23**
from ladder	9
from another level	5
slip/trip/stumble	3
from scaffold	3
not specified	3

RANK #2	29%
SHARP OBJECT	**19**
razor/knife	5
power tool	5
metal stud	4
metal/sheetmetal	2
wood/splinter	1
glass	1
ceiling tile	1

RANK #3	15%
OVEREXERTION / STRENUOUS MOVEMENT	**10**
lifting/carrying	7
other	1
not specified	2

RANK #4	9%
OBJECT IN EYE	**6**
drywall/plaster	3
metal dust	1
concrete/cement	1
not specified	1

RANK #5	6%
STRUCK BY/AGAINST OBJECT	
otwall/plaster	**3**
(INCL. FALdoor	**35%**

Chart 12-C

66 injured drywall and plaster workers treated for 75 diagnoses

Diagnoses by body part

RANK #1	**39% ***
SPRAIN, STRAIN, PAIN	**26 ****
low back	9
neck	5
hand/wrist	5
shoulder/upper arm	2
knee/leg/hip	2
upper back	1
trunk	1
ankle/foot	1
elbow/forearm	1

RANK #2	**36%**
LACERATION	**24**
finger/thumb	13
hand/wrist	7
elbow forearm	2
trunk	1
face/head	1

RANK #3	**15%**
CONTUSION,ABRASION, FOREIGN OBJECT (excl. eye)	**10**
knee/leg/hip	3
shoulder/upper arm	2
face/head	2
trunk	1
hand/wrist	1
finger/thumb	1
ankle/foot	1
multiple	1

RANK #4	**14%**
EYE INJURIES	**6**

	14%
ALL OTHERS	**5**
FRACTURE	
hand/wrist	1
elbow/forearm	1
ankle/foot	1
HEAD INJURY	
head	1
OTHER	
finger	1

For example:

* Percentage of drywall workers with one or more sprains or strains. Percents add to more than 100 because some injured workers had more than one diagnosis.

** Number of drywall workers with one or more sprains or strains.

Asbestos and Insulation Workers

FROM November 1990 to October 1997, 56 construction workers who identified themselves as insulators or asbestos workers were treated for work-related injuries at the George Washington University Emergency Department. Of these, 31 specified that they worked with asbestos and the remaining 25 simply called themselves insulators or installers. This number of workers is too small a statistical sample to use to precisely identify risks and recommendations.

Demographic Characteristics: Six of the 56 injured insulators were female. The average age of the injured insulators was 33 and 79% were under the age of 40. Thirty-eight percent of the insulators were Hispanic, 30% were black, and 27% were white.

Causes of Injury, Diagnoses, Body Locations (charts 13-A through 13-C): Falls from ladders accounted for one out of every eight injuries in this group. For instance, one worker was removing asbestos from a ceiling and fell backward off his ladder from a height of 7 Feet; another worker fell through a ladder and bruised her knee on a rung. One insulation worker was hospitalized; he had fallen 20 to 25 feet down an elevator shaft and was treated for chest and abdominal pain, as well as multiple abrasions.

The nine eye injuries all appeared to be directly related to installing or removing insulation. Seven of the insulators had suffered a back injury, primarily as a result of falling or straining. One of the falls illustrates the hazard of poor housekeeping: an insulation worker strained his lower back after tripping over a container while carrying a box of insulation. Another worker strained his back while working in a tunnel in an awkward posture. One insulator suffered a contusion after hitting his hand while demolishing a wall; another was struck on his shoulder and hip by a collapsing brick wall.

Recommendations: The injuries reflect the wide variety of assigned tasks for this group (demolition, sanding, operating power tools, and installing insulation) and the general hazards of the construction environment. Demolition in particular appears to result in substantial risk of injury, which is not surprising given that pulling down structural materials often requires workers to use a lot of force. One injury prevention priority should be to explore and promote safer demolition work practices.

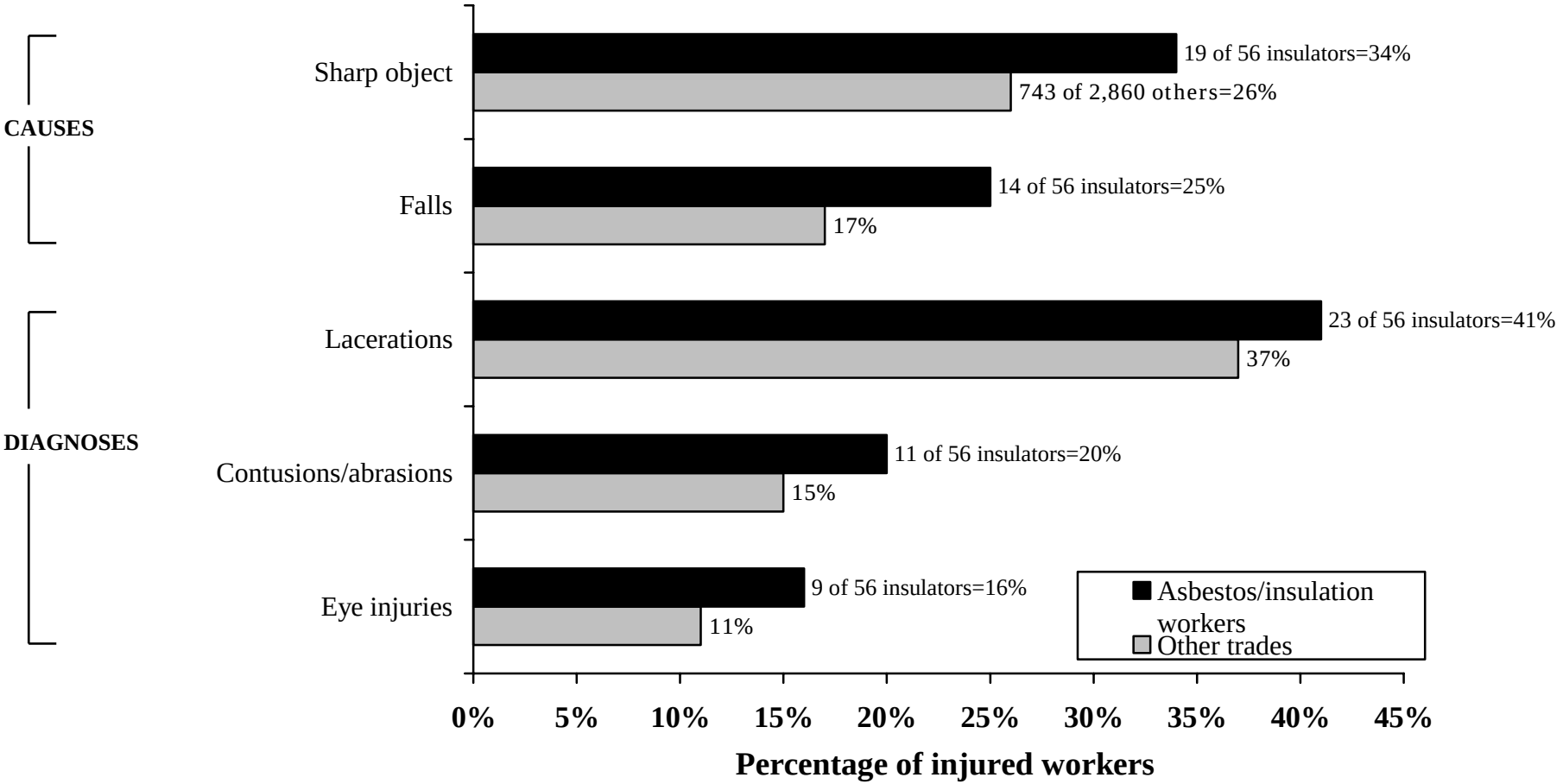
Given that about one-quarter of the injuries in this group were caused by contact with a sharp object to the hand, wrist, or fingers, gloves are one solution. Protective equipment is not always an ideal choice, given that a worker's manual dexterity is reduced; identification of gloves that allow more dexterity should be a priority. The most obvious solution to reducing the number of eye injuries also involves protective equipment; protective eyewear should be worn for overhead work and dusty tasks. Training workers

Chart 13-A

56 injured asbestos & insulation workers

Percentage of workers in selected injury categories

Compared to 2,860 other injured construction workers



ℹ : For diagnoses, percents add to more than 100 because some workers had more than one diagnosis.

Chart 13-B

56 injured asbestos & insulation workers

Detailed causes of injury

RANK #2	25%
FALL	**14**
from ladder	7
slip/trip/stumble	2
from another level	2
from scaffold	1
from stairs	1
into a hole	1

RANK #3/4 (tie)	14%
OBJECT IN EYE	**8**
insulation	4
metal dust	1
chemical 61.5( )-33T* 4	

Chart 13-C

56 injured asbestos & insulation workers treated for 61 diagnoses

Diagnoses by body part

RANK #1	41% *
LACERATION	**23 ****
finger/thumb	10
hand/wrist	4
elbow forearm	3
face/head	3
shoulder/upper arm	1
knee/leg/hip	1
ankle/foot	1

RANK #2	21%
CONTUSION,ABRASION, FOREIGN OBJECT (excl. eye)	**12**
hand/wrist	4
finger/thumb	2
elbow/forearm	2
trunk	1
back	1
face/head	1
multiple	1
knee/leg/hip	1

RANK #3/4 (tie)	16%
SPRAIN, STRAIN, PAIN	**9**
low back	6
trunk	2
neck	2
shoulder/upper arm	1

RANK #3/4 (tie)	16%
EYE INJURIES	**9**

	7%
ALL OTHERS	**4**
CRUSH	
hand/wrist	1
FRACTURE/DISLOCATION	
shoulder/upper arm	1
DIZZINESS	
systemic	1
HEAT	
systemic	1

For example:

* Percentage of insulators with one or more lacerations. Percents add to more than 100 because some injured workers had more than one diagnosis.

** Number of insulators with one or more lacerations.

Tasks that resulted in acute muscle damage included repetitive hammering and lifting loads of rebar or roofing paper.

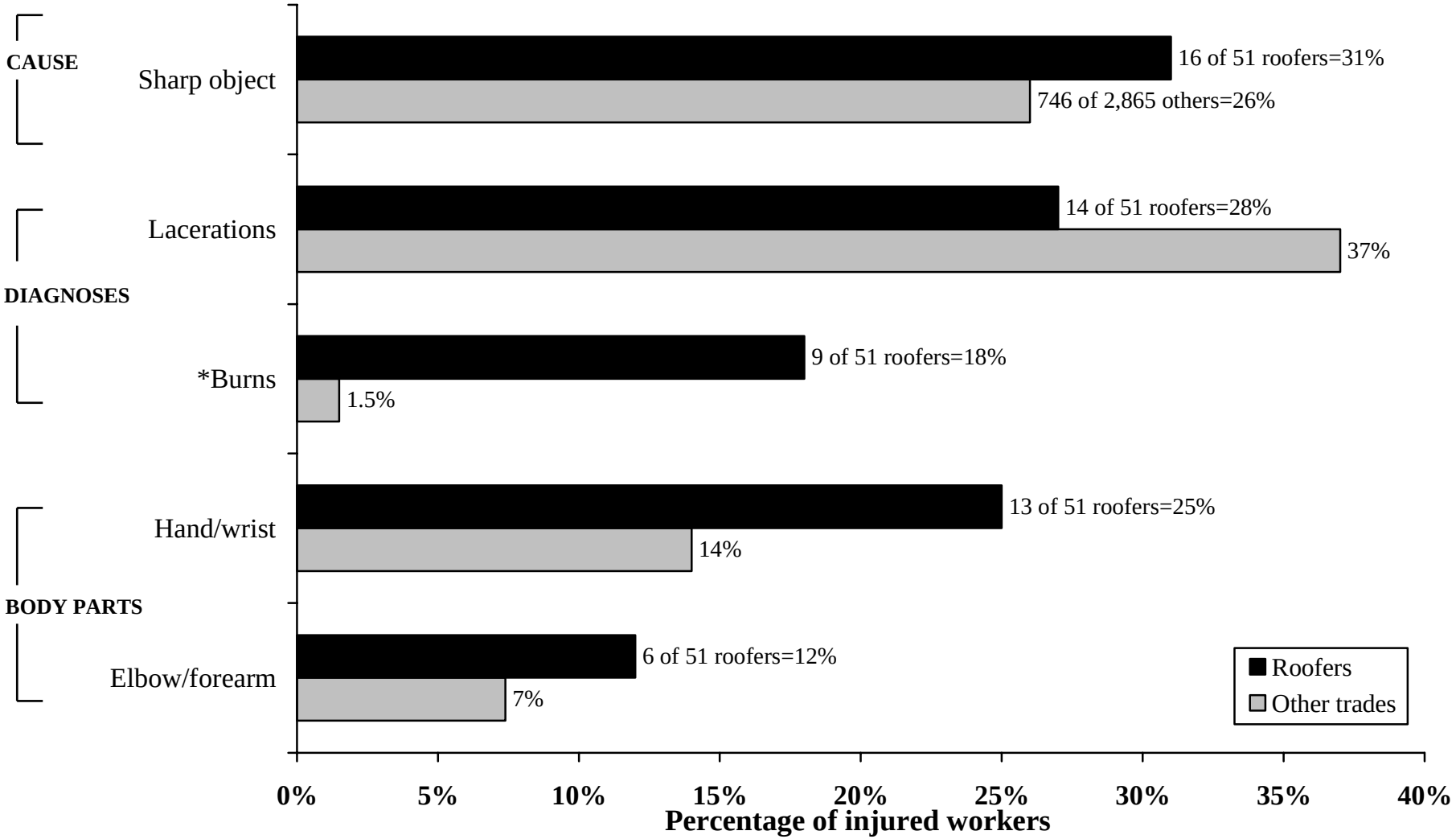
Recommendations: Although this group of injured roofers is small, their injury patterns point very clearly to some of the hazards of their trade. Injury prevention programs might focus on (1) identifying and using utility knives with blades that can be changed more safely, and encouraging workers to take special precautions while using knives and changing knife blades, (2) exploring the feasibility of splash-reducing covers for asphalt machines and tar buckets, (3) promoting protective eye wear, especially while grinding, chipping, or working with asphalt, (4) having workers wear long sleeves and long pants to protect from tar splashes, and (5) promoting the use of steel-shank and slip-resistant boots.

Chart 14-A

51 injured roofers and waterproofers

Percentage of workers in selected injury categories

Compared to 2,865 other injured construction workers



*Third-most-common diagnosis. For diagnoses and body parts, percents add to more than 100 because some injured workers had more than one diagnosis.

GWU Emergency Department injury data, 11/90 - 10/97

Chart 14-B

51 injured roofers and waterproofers

Detailed causes of injury

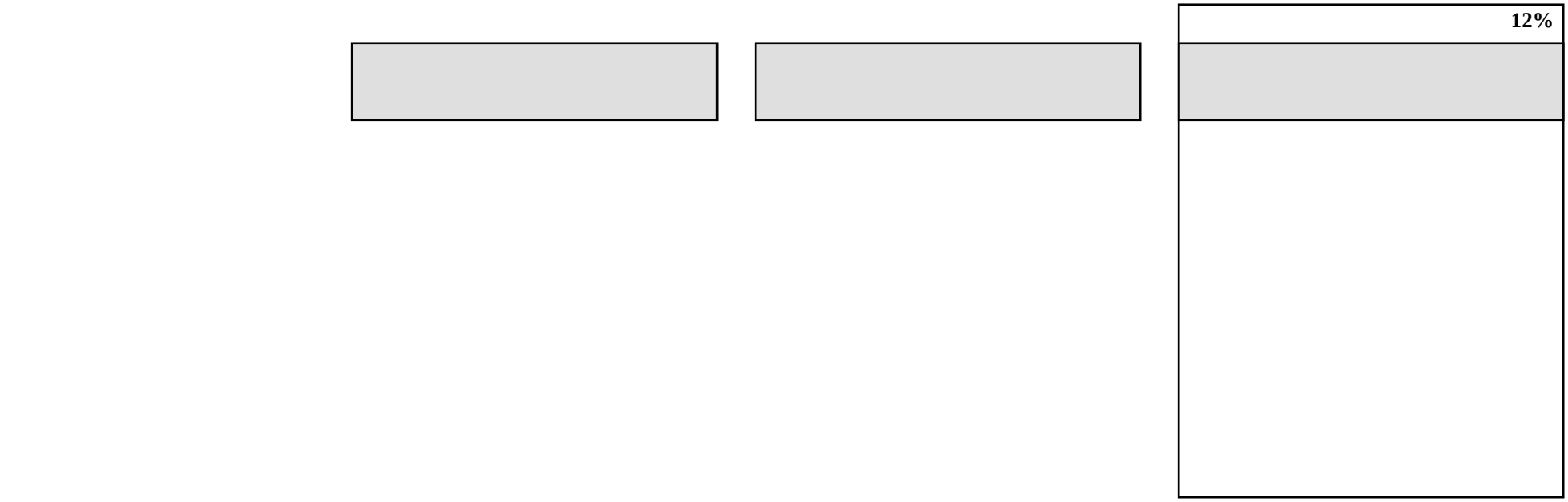


Chart 14-C

51 injured roofers and waterproofers treated for 57 diagnoses

Diagnoses by body part

RANK #1	28% *
LACERATION	**14 ****
hand/wrist	6
elbow forearm	3
finger/thumb	3
ankle/foot	2

RANK #2	20%
SPRAIN, STRAIN, PAIN	**10**
low back	5
ankle/foot	1
elbow/forearm	1
hand/wrist	1
knee/leg/hip	1
shoulder/upper arm	1

RANK #3	18%
BURNS	**9**
hand/wrist	5
multiple	2
face/head	1
unspecified	1

RANK #4	14%
CONTUSION,ABRASION, FOREIGN OBJECT (excl. eye)	**7**
finger/thumb	2
ankle/foot	1
elbow/forearm	1
multiple	1
neck	1
shoulder/upper arm	1
trunk	1

For example:

* Percentage of roofers with one or more lacerations. Percents add to more than 100 because some injured workers had more than one diagnosis.

** Numb

Heavy-Equipment Operators

FROMdnt-137.7(s)]TJ-521.8 -mr150 TD -0.0051 Tc 0.0058 Tw [opberator, drillers,

Chart 15-A

43 injured heavy equipment operators

Percentage of workers in selected injury categories

Compared to 2,873 other injured construction workers

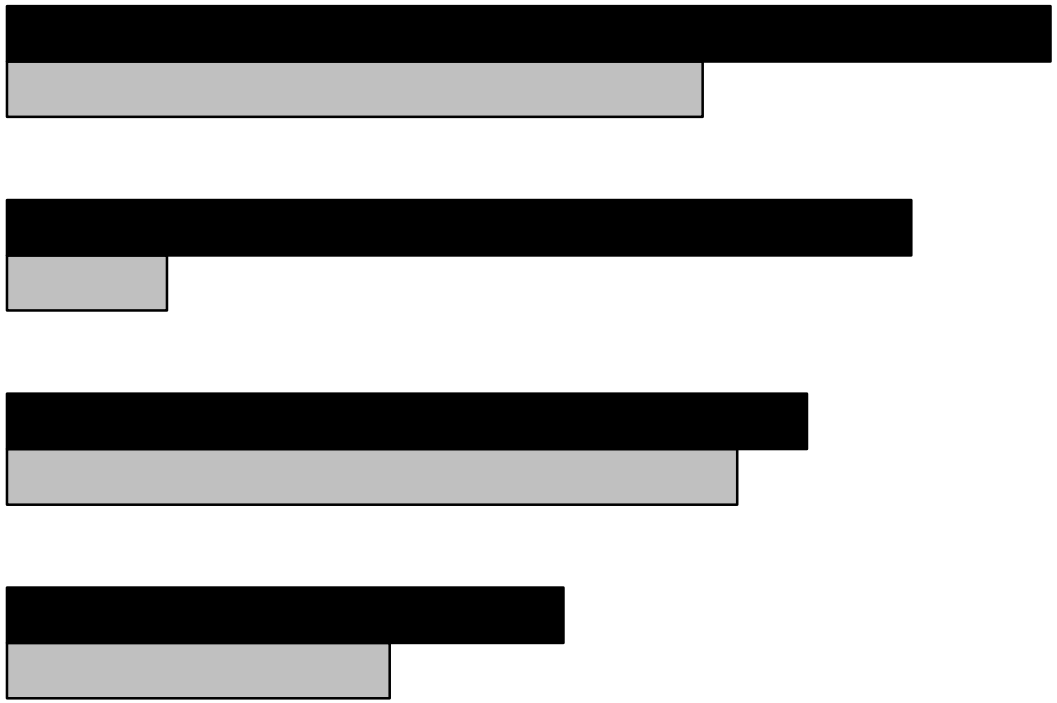


Chart 15-B
43 injured heavy equipment operators
Detailed causes of injury

RANK #1	30%
STRUCK BY/AGAINST OBJECT (INCL. FALLING OBJECT)	**13**
granite/marble/stone	2
piece of metal/sheetmetal/duct	2
power tool (excl. drill)	1
wire/cable	1
pipe	1
metal object	1
hammer/sledge	1
door jamb/doorway	1
other:	
electric box, window pane, motor	3

RANK #2	26%
MACHINERY RELATED	**11**
lifting machinery	9
earth moving machine	2

RANK #3	14%
OVEREXERTION / STRENUOUS MOVEMENT	**6**
lifting/carrying	4
stopping a fall/falling object	1
other: turning head suddenly	1

RANK #4	9%
SHARP OBJECT	**4**
metal/sheetmetal	2
nail	1
wire	1

	21%
ALL OTHERS	**9**
CAUGHT BETWEEN OBJECTS	
involving cable	1
involving a beam	1
FALL	
from another level	2
FOREIGN OBJECT, EYE	1
OTHERS	
burn, caustic/corrosive	1
electrical exposure	1
i	

Welders

FROM November 1990 to October 1997, 36 construction workers who identified themselves as welders were treated for work-related injuries at the George Washington University Emergency Department. Although the group of injured welders was very small statistically, some distinct risk patterns were identified. Most tradespeople know that eye hazards and respiratory illness are commonly linked to welding. It is clear from the spectrum of injuries seen here that welders perform other tasks besides welding that put them at risk of injury.

Demographic Characteristics

without any respiratory protection. Two workers burned their forearms after leaning against pipes that had recently been cut with a blowtorch. These injuries indicate the range of hazards that welders are exposed to, but the numbers are too small to make a reliable comparison to the overall construction injury patterns. Fortunately, none of the welders was seriously enough injured to require hospital admission.

Recommendations: Eye protection is the most obvious starting point for welding-related injuries. The welder must wear appropriate protection with sideshields to reduce the likelihood of radiation and particulate entering the eyes. Notably, not a single welder was treated for eye burns. That four of the 11 welders who sustained eye injuries reported that they were wearing eye protection at the time of their injury highlights that the eye protection must be appropriate for the task. The welder's face shield, while protecting from arc flash, does not protect the eyes from particles, nor does it protect the lungs from welding fume.

Aside from eye injuries, the diversity of injury circumstances and diagnoses makes it difficult to identify specific hazards. However, the range of injury circumstances (for example, falls from scaffolds, being struck by very heavy objects) does indicate that welders experience the hazards of the general construction environment, and that prevention measures should be accordingly implemented. Finally, the range of trades that were treated for welding-related eye injuries illustrates that workers from other trades are at risk and should be thoroughly instructed in welding safety if they will be welding or working alongside welders.

Chart 16-A

36 injured welders

Percentage of workers in selected injury categories

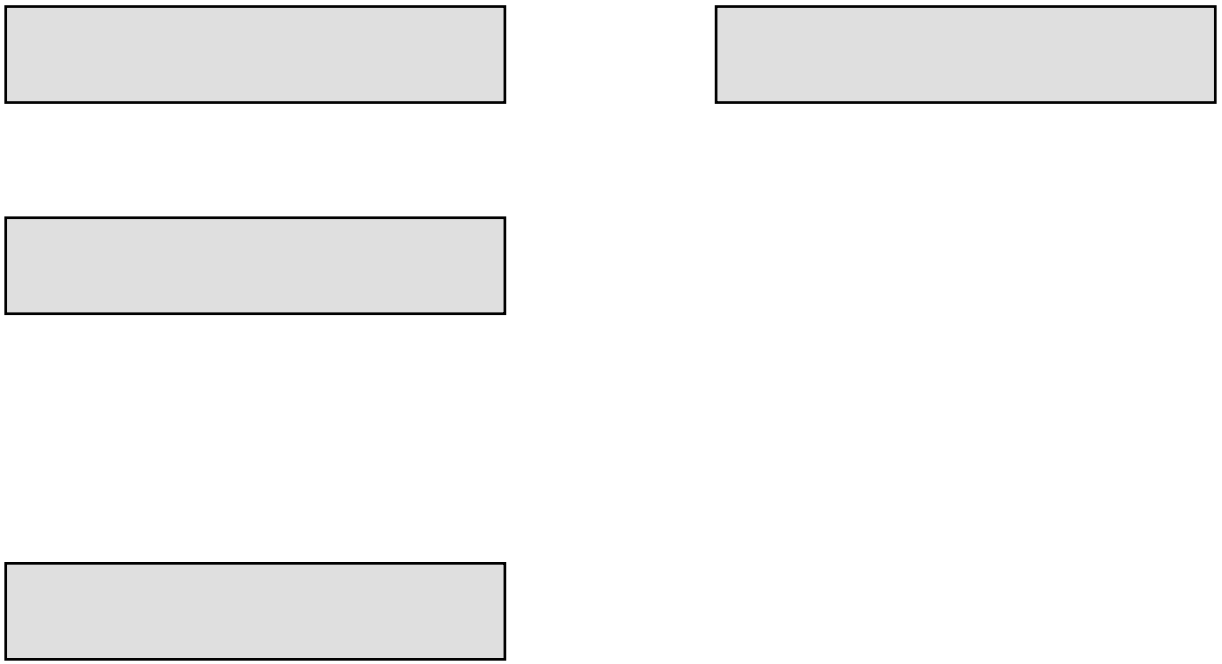
Compared to 2,880 other injured construction workers

Chart 16-B
36 injured welders
Detailed causes of injury

RANK #2	22%
MACHINERY RELATED	**8**
lifting machinery	1
other machinery:	
welder	6
grinder	1

RANK #3	17%
FALL	**6**
from scaffold	4
slip/trip/stumble	1
from an	

Chart 16-C



Elevator Constructors and Mechanics

DURING this seven-year period (11/90-10/97), 24 construction workers identified themselves as elevator constructors or mechanics

Chart 17-A

24 injured elevator constructors

Percentage of workers in selected injury categories

Compared to 2,892 other injured construction workers

Chart 17-B
24 injured elevator constructors
Detailed causes of injury

RANK #1	25%
SHARP OBJECT	**6**
metal/sheetmetal	2
hand tool	1
nail	1
razor/knife	1
wire	1

RANK #2/3 (tie)	21%
OVEREXERTION/ STRENUOUS MOVEMENT	**5**
lifting/carrying	3
drilling	1
not specified	1

RANK #2/3 (tie)	21%
STRUCK BY/ AGAINST OBJECT	**5**
pipe	1
board/wood	1
other: weight, chain	2
not specified	1

RANK #	13%
FALLS	**3**
slip/trip/stumble	1
from ladder	1
not specified	1

	33%
ALL OTHERS	**5**
CAUGHT IN/BETWEEN	
metal plate/object	1
door	1
MACHINERY-RELATED	
lifting machinery	2
OBJECT IN EYE	
metal dust	1

Guide to Reading The Bar Charts

- All of the charts are based on the medical records of 2,916 construction tradespeople who were treated for work-related injuries at the George Washington University Emergency Department between **November 1, 1990 and October 31, 1997**. Construction tradespeople working in maintenance settings are included.

- The **charts do not predict or explain injury risk** because, even though we know how many workers were treated for on-the-job injuries at this hospital, we do not know how many workers were treated at other hospitals, or were injured and not treated at all, or were working but not injured during this time.

- In most cases, bars are included on a chart only if they represent **at least three workers**.

- it represents workers who did not fit into a category or whose category had fewer than three people.

-

- In some cases, the **diagnosis appears to be similar to the cause of injury**, but keep in mind that they can be quite different; for example,

machinery-related, caught between, toxic exposure, electrical exposure, vehicle related, contact with hot liquid/objÄeachine2(arts la 1,/F2/)-5.1.2(os)