

**Musculoskeletal Injuries  
among Construction  
Workers:**

***Hard Matter--A Matter of  
the Heart***

Constructed by

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In the US, estimates of up to 30% of workers, including union members, do not report injuries

Under-reporting may be even a more significant problem in transition economies

Differences in employer attitudes toward 'worker safety' may predict occupational injuries, irrespective of underlying cultural differences in attitudes to laborer's value of life

[Int J Occup Saf Ergon](#), 2013;19(1):97-105.

[Moore JT](#), [Cigularov KP](#), [Sampson JM](#), [Rosecrance JC](#), [Chen PY](#).

*ER-reported* MSK Injury Rates  
in the Construction Industry  
in the United States

**TABLE IV.** Frequencies of Construction Industry-Related Injuries Treated in US Hospital Emergency Departments by Nature of Injury, NEISS-Work 1998–2005

Diagnosis	National estimate	95% confidence interval	Proportion of total (%)
Laceration	735,600	512,300–959,000	23
Sprain/strain	696,400	421,300–971,600	22
Contusion/abrasion	531,800	366,900–696,600	17
Fracture	265,200	195,400–335,000	8
Foreign body	226,400	147,100–305,600	7
Puncture	181,400	111,000–251,800	6
Burns	63,900	51,600–76,100	2
Internal organ damage	43,900	22,500–65,400	1
Crushing	35,200	24,800–45,600	1
Dermatitis/conjunctivitis	32,200	20,300–44,200	1
Dislocation	25,400	17,800–33,000	1
Avulsion	22,800	16,500–29,000	1
Amputation	17,700	12,300–23,200	1
Other <sup>a</sup>	338,900	288,100–389,700	11

<sup>a</sup>Includes concussion, hematoma, ingested/aspirated object, dental injury, nerve damage, anoxia, hemorrhage, electric shock, poisoning, and other unspecified injury diagnoses. The individual diagnosis categories did not meet minimum reporting requirements.

**TABLE II.** Frequencies and Rates of Construction Industry-Related Injuries Treated in US Hospital Emergency Departments by Worker Characteristics, NEISS-Work 1998–2005

	National estimate <sup>a</sup>	95% confidence interval	Treated and released (%)	Rate <sup>b</sup>	95% confidence interval
<b>Age in years</b>					
≤15	*	*	*	—	—
16–19	167,000	94,100–241,700	97	810	450–1,170
20–24	579,000	332,900–824,900	97	720	410–1,030
25–34	1,040,500	706,900–1,374,200	96	510	350–680
35–44	871,600	659,600–1,083,600	96	370	280–460
45–54	406,300	310,900–501,700	94	240	180–300
55–64	132,300	101,200–163,400	92	190	150–240
65+	17,700	13,900–21,500	89	140	100–180
Missing	*	*	*	—	—
<b>Sex</b>					
Male	3,116,600	2,169,800–4,063,500	96	430	300–560
Female	99,800	65,400–134,100	98	150	100–210
Missing	*	*	*	—	—
<b>Race/ethnicity</b>					
Hispanic	361,500	189,600–533,400	94	270	140–390
Non-Hispanic	2,264,300	1,468,100–3,060,500	97	350	220–470
White	2,046,700	1,240,800–2,852,700	97	280	170–400
Black	196,100	106,100–286,000	97	410	220–600
American Indian	*	*	*	—	—
Asian/Pacific Islander	*	*	*	—	—
Unknown	591,000	281,500–304,500	94	—	—

<sup>a</sup>Estimates not meeting minimum reporting requirements are indicated with an asterisk (\*).

<sup>b</sup>Rate per 10,000 full-time equivalents (FTEs).

**TABLE III.** Frequencies of Construction Industry-Related Injuries Treated in US Hospital Emergency Departments by Event or Exposure and Source of Injury, NEISS-Work 1998–2005

	National estimate <sup>a</sup>	95% confidence interval	Proportion of total (%)	Treated and released (%)
<b>Event or exposure<sup>b</sup></b>				
Contact with objects and equipment	1,734,000	1,201,400–2,266,600	54	97
Bodily reaction and exertion	601,700	368,700–834,700	19	99
Falls	555,700	390,700–720,800	17	90
Exposure to harmful substances or environments	167,200	125,900–208,600	5	96
Transportation accidents	59,700	40,300–79,100	2	88
Fires and explosions	*	*	*	*
Assaults and violent acts	*	*	*	*
Nonclassifiable	71,300	52,600–90,000	2	95
<b>Source of injury<sup>b</sup></b>				
Parts and materials	854,600	565,100–1,144,000	27	97
Structures and surfaces	621,300	428,000–814,700	19	91
Tools, instruments, and equipment	438,700	311,100–566,300	14	98
Persons, plants, animals, and minerals	294,000	189,200–398,800	9	98
Machinery	147,900	105,500–190,200	5	94
Vehicles	91,600	62,800–120,500	3	93
Containers	87,500	58,700–116,200	3	99
Chemicals and chemical products	65,400	47,300–83,400	2	97
Furniture and fixtures	38,000	27,300–48,700	1	98
Other sources	228,200	159,300–297,000	7	98
Nonclassifiable	349,700	262,400–436,900	11	98

<sup>a</sup>Estimates not meeting minimum reporting requirements are indicated with an asterisk (\*).

<sup>b</sup>Event or exposure and source of injury categories reflect OIICS division groupings [Bureau of Labor Statistics, 1992].

# Fatalities in the Construction Industry in the US State-by-State:

**TABLE. Number, rate,\* birth status, and most common fatal event† and Industry‡ associated with Hispanic work-related injury deaths, by selected states¶ — United States, 2003–2006**

State	No.	Rate	Foreign-born %	Fatal event (%)	Industry (%)
Arizona	114	3.9	62	Highway incident (20)	Construction (25)
California	773	3.7	71	Fall to lower level (18)	Construction (27)
Colorado	87	5.4	59	Highway incident (29)	Construction (31)
Florida	417	6.3	81	Highway incident (26)	Construction (34)
Georgia	115	9.6	77	Fall to lower level (25)	Construction (56)
Illinois	104	3.8	72	Fall to lower level (24)	Construction (28)
Maryland	58	6.8	91	Highway incident (19)	Construction (59)
Michigan	30	4.7	50	Highway incident (27)	Construction (27)
Nevada	48	5.0	65	Fall to lower level (31)	Construction (46)
New Jersey	116	4.7	81	Fall to lower level (25)	Construction (29)
New Mexico	70	5.1	34	Highway incident (30)	Construction (30)
New York	172	3.4	73	Fall to lower level (25)	Construction (38)
North Carolina	97	7.8	75	Fall to lower level (18)	Construction (47)
Ohio	33	5.5	61	Highway incident (21)	Construction (30)
Oklahoma	32	10.3	44	Fall to lower level (19) Fire/explosion (19)	Construction (41)
Pennsylvania	41	5.3	51	Homicide (29)	Transportation/ warehousing (22)
South Carolina	51	22.8	88	Fall to lower level (24)	Construction (63)
Tennessee	36	8.9	92	Fall to lower level (22)	Construction (44)
Texas	687	4.8	55	Highway incident (22)	Construction (37)
Virginia	63	6.5	87	Fall to lower level (33)	Construction (57)
Washington	33	4.0	70	Highway incident (36)	Agriculture (39)
<b>Total</b>	<b>3,609</b>	<b>4.9</b>	<b>67</b>	<b>Highway incident (19)</b>	<b>Construction(34)</b>

\* Per 100,000 civilian workers aged  $\geq 16$  years.

† Event coded according to the Bureau of Labor Statistics Occupational Injury and Illness Classification System.

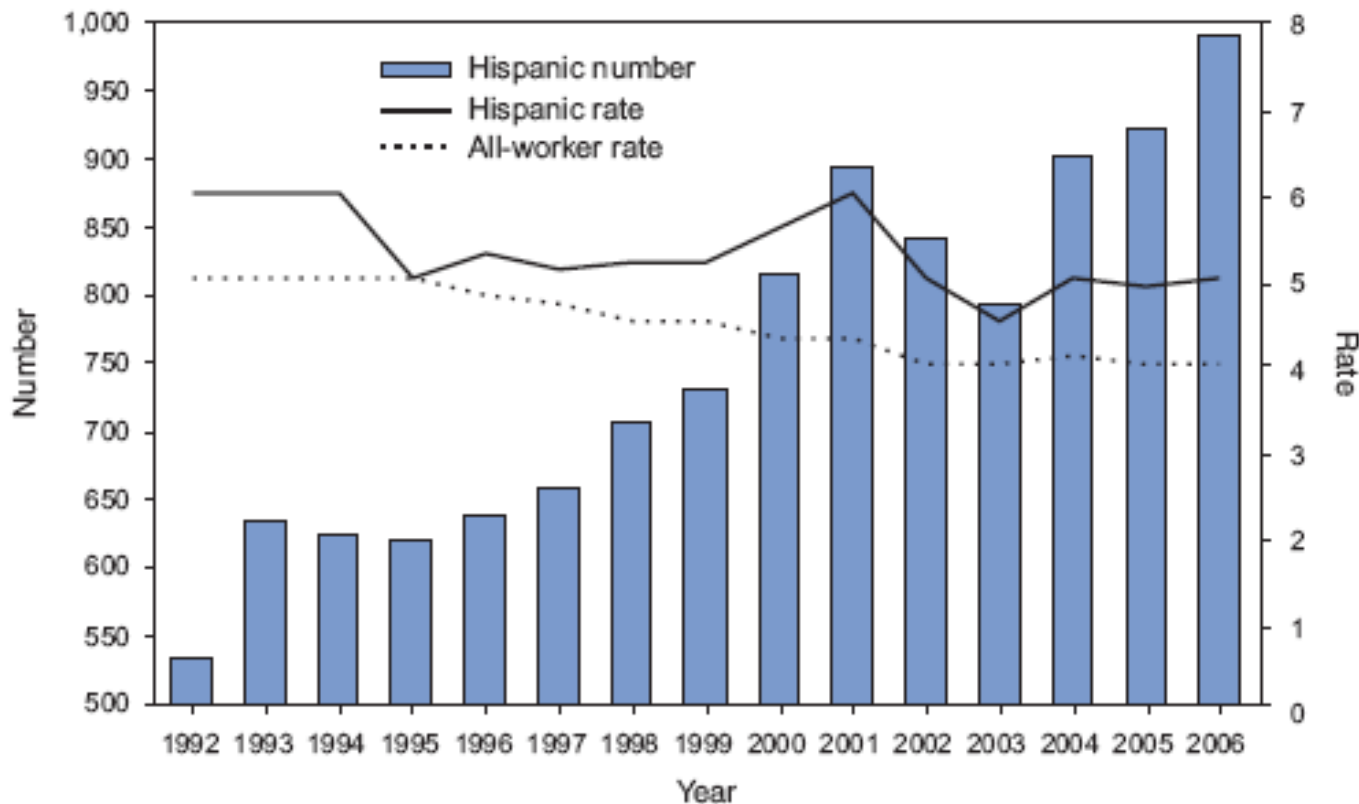
‡ Industry coded according to the 2002 North American Industry Classification System.

¶ States reporting at least 30 work-related injury deaths of Hispanic workers during 2003–2006.



# US Construction Industry Fatality Rates:

**FIGURE 1. Number\* and rate† of work-related injury deaths of Hispanic workers compared with rate for all workers — United States, 1992–2006**



\* Data from 2001 exclude fatalities resulting from the September 11 terrorist attacks.

† Per 100,000 civilian workers aged  $\geq 16$  years.

*ER-reported* MSK  
Injury Rates in the  
Construction Industry  
in Switzerland

**Table 2:** Causes and frequencies of the injuries.

Causes	N
Hit by a moveable object or piece of equipment	218 (27.9%)
Contact with a stationary object or piece of equipment	209 (27%)
Squashing or compression by equipment or objects	102 (13%)
Squashing or compression into collapsing material	62 (7.9%)
Non-specific	28 (3.6%)
Abrasions	17 (2.2%)
Abrasions from vibrations	1 (0.1%)
Unclassified	145 (18.5%)

**Table 3:** Frequencies and distribution of the diagnoses.

Diagnoses	N
Contusion/abrasion	223 (28.5%)
Fracture	220 (28.1%)
Sprain/stretching	146 (18.7%)
Cut	136 (17.4%)
Other diagnoses	57 (7.3%)

**Table 4:** Distribution of the injuries over the regions of the body.

Region	N
Extremities	472
External	178
Head/neck	133
Abdomen	81
Chest	74
Face	68

**Table 5:** Distribution of the median ISS over the age groups.

Age Group	N
<19	36 (4.6%)
20–29	210 (26.9%)
30–39	238 (30.4%)
40–49	203 (26.0%)
50–59	79 (10.1%)
60+	16 (2.0%)

There was a trend to higher ISS values at over 60 ( $p = 0.089$ ).

# Ergonomic Risk Factors in Construction

Scott Schneider

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# MSK Injuries in the Construction Industry: Changing Global Attitudes

- Maintain data reporting at national, state and local levels to minimize lack of reporting
- Develop government standardized reporting guidelines for worker safety, including vulnerable immigrant workforce.
- Increase education and training, especially for younger entry level workers who have usually had the highest rates of injuries.

# Scope of the Problem

- A 50% higher rate of musculoskeletal disorders among construction workers compared to all other workers (Schneider, 2001).
- “Sprain and strain” injuries account for about 30 percent of all injuries in this industry (BLS, 2012) at 44.1 per 10,000 full time workers, higher than for all private sector workers.

# Hierarchy of Controls for Solving Ergonomic Problems in Construction:

From ANSI A10.40 Standard on Preventing Musculoskeletal Problems in Construction

- Elimination
- Substitution
- Engineering controls
- Administrative changes
- Work practice changes
- Training
- Protective Equipment and
- Assessment of physical capabilities of the individual (ANSI A10.40)













Social and Economic Impact of  
Injury and Illness Among  
Construction  
Roofers (Center to Protect Workers  
Rights—CPWR)

Laura Welch, MD

Katherine Hunting PhD

Elizabeth Haile, MS

*Am J Ind Med. 2010 Jun;53(6):552-60. Impact of musculoskeletal and medical conditions on disability retirement—a longitudinal study among construction roofers. Welch LS, Haile E, Boden LI, Hunting KL.*

# What makes construction different?

- Work changes daily as building goes up
- One construction worker can have several employers each year
- Construction workers are less likely to have health insurance than manufacturing workers
- Over 90% of construction employers have 10 or fewer employees; 70% have no employees

# Employment and aging in the construction industry

- Total employment in construction grew 50% between 1980 and 2000
- Proportion of construction workers over age 40-49 increased from 17% of all workers to 28% of all workers between 1980 and 2000

# Disability retirement

- 10% of construction workers do not return to work after an acute injury
- Construction workers with an MSD, lung disease, or injury are more likely to retire on disability than workers with the same conditions in less physically demanding work
- Two-thirds of construction workers in Germany retire on disability compared to 44% of workers in all industries combined



## Identified risk factors for disability retirement (all industries)

- Age
- MSD
- Injury severity, pain, functional disability
- Low work-ability
- Physically demanding work
- Lack of job accommodation
- Psychosocial factors: lack of co-worker support, expectations of recovery
- Combination of MSD, physically demanding work, and low work-ability had a 25 fold risk for disability retirement





## Study design overview

- 989 working roofers interviewed at baseline
- Targeted enrollment equal proportion in age groups 40-44, 45-49, 50-54, 55-59
- Asked about injury, illness, lost work time, job accommodations, social and economic impact
- Re-interviewed after one year

# Questionnaire

- SF-12
- 8 items from Work Limitations Questionnaire
- Additional social and economic impact questions adapted from Pransky et al\*
- Questions about employer response to injury
- Assessment of frequency and duration of musculoskeletal symptoms

\* J Occup Environ Med. 2005  
Aug;47(8):769-77

## Frequency of medical and musculoskeletal conditions at baseline interview

- 69% had seen a physician for a chronic medical or a musculoskeletal condition (MSD) in the prior two years
- 54% had an MSD, 42% a medical condition
- 42% had multiple conditions, 28% reported more than one MSD

# Frequency of all medical and musculoskeletal conditions

Most prevalent conditions:

29% low back/sciatica

15% knee disorders

15% lung disorders

14% neck and upper back

11% shoulder

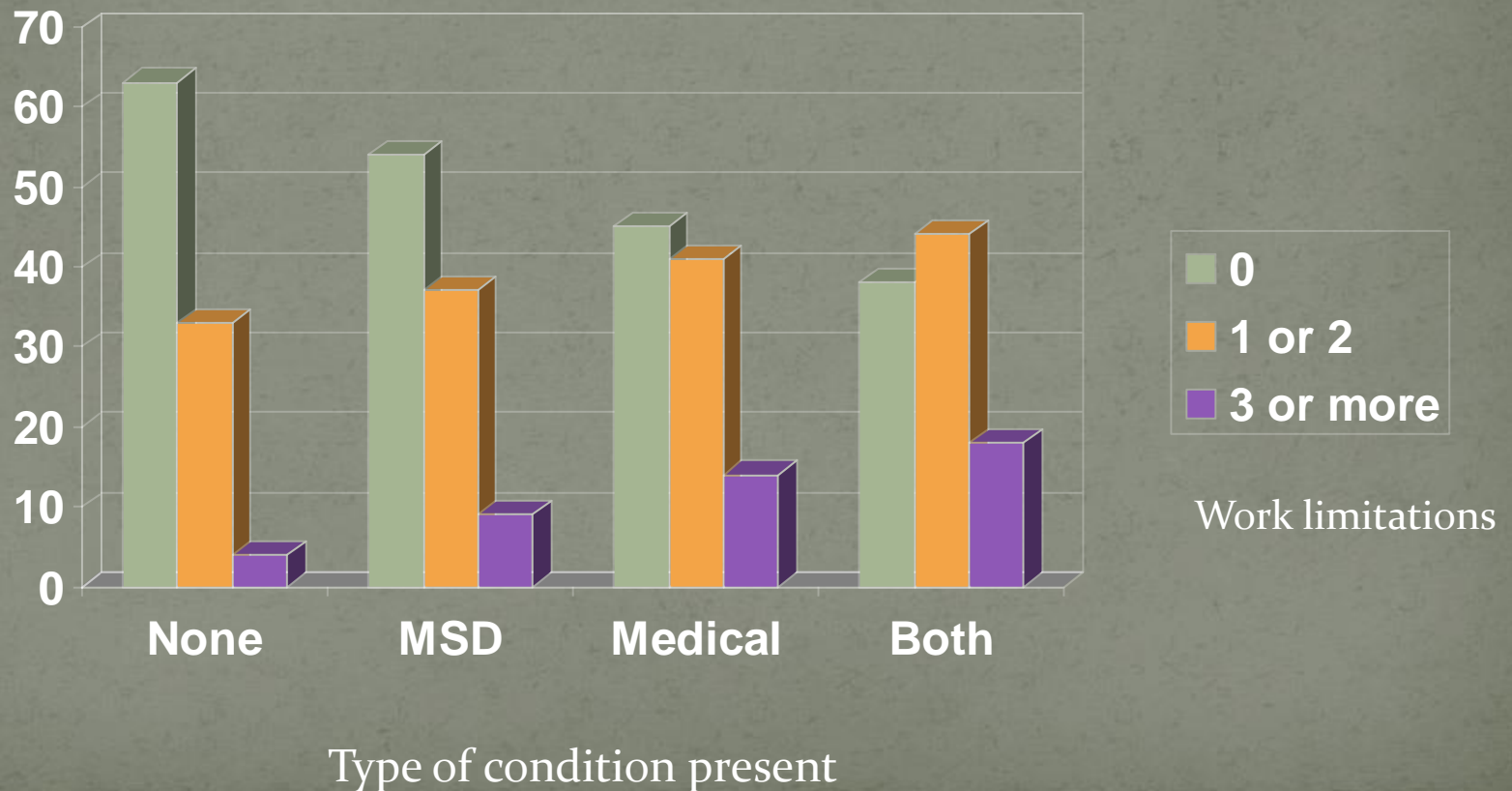




## **Workers over 55 years old at baseline**

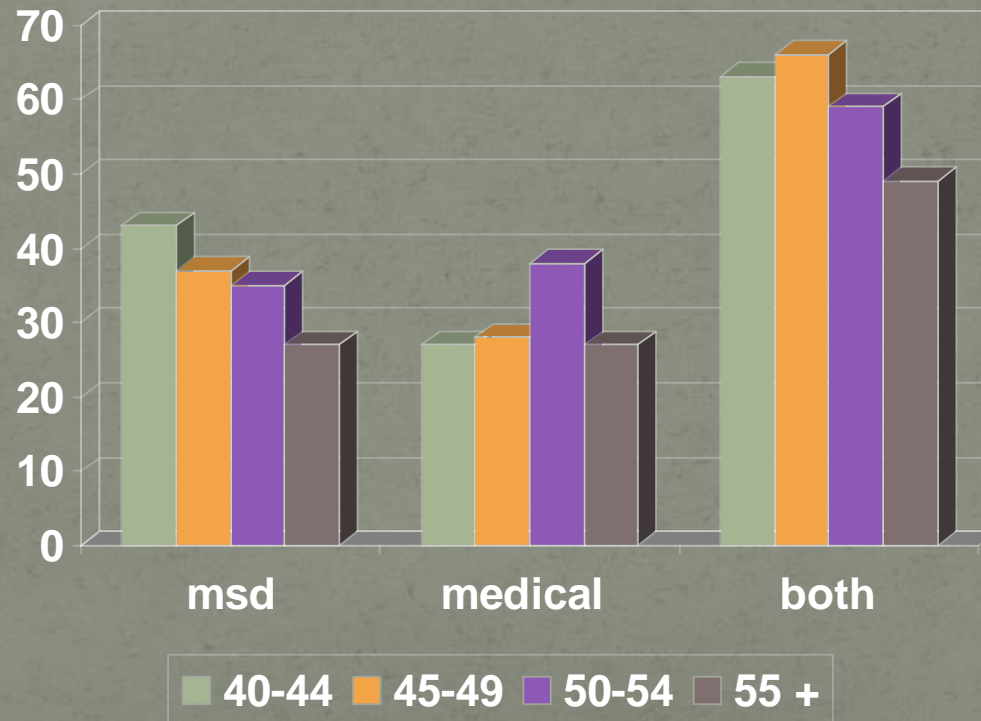
- Had lower physical functioning
- Were more likely to have both a medical condition and MSD, primarily due to increase in medical conditions
- Age was not related to missed work, work limitations, general health or vitality

# Work limitations and medical conditions or MSDs

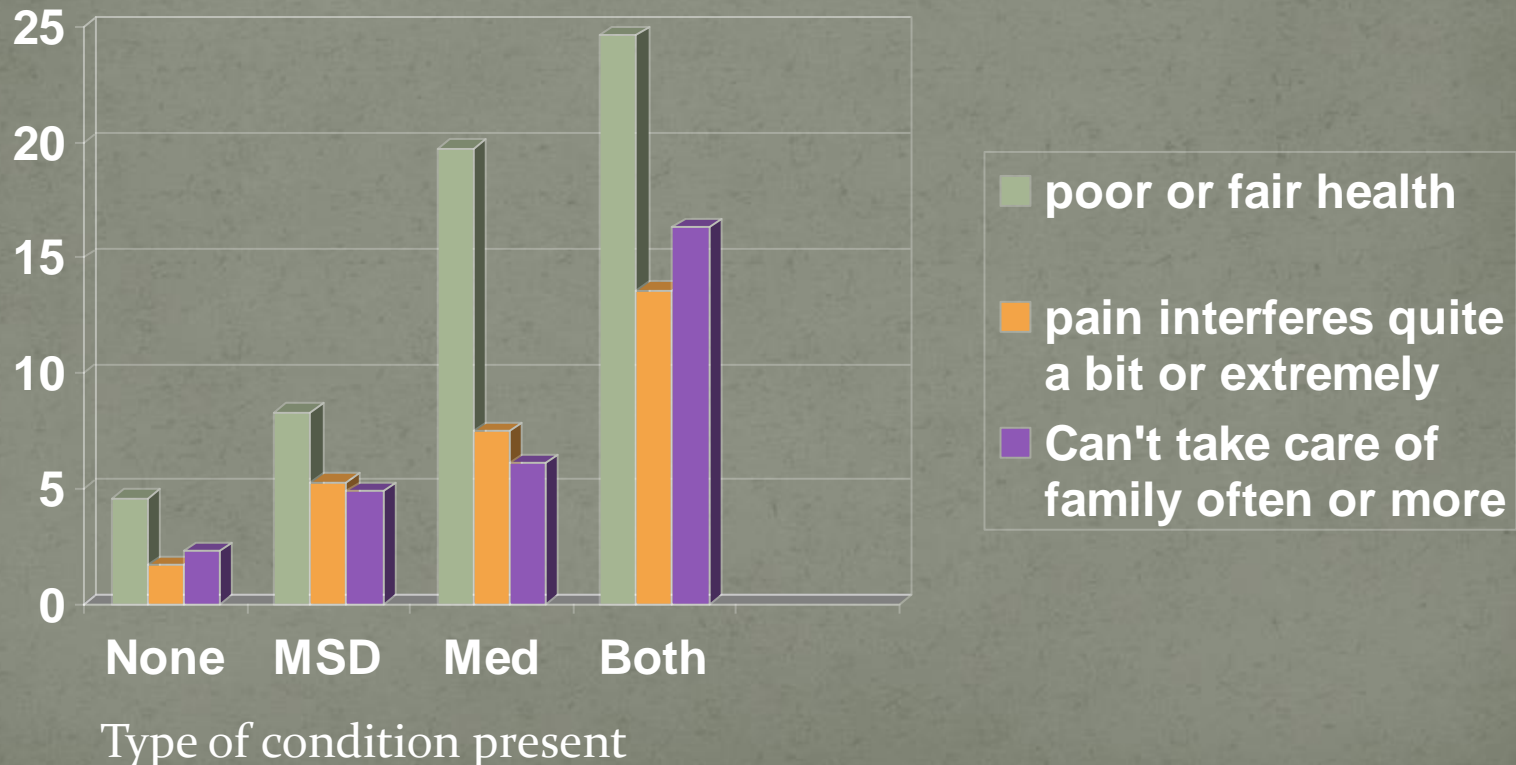


# Missed work among 979 respondents by conditions and age

(a respondent can have more than one condition)



# Participants' assessment of health, pain, and ability to care for family related to medical conditions or MSDs



# MSDs at one year

- Among the roofers with MSDs
  - Each year increase in age associated with a 17% increase in leaving
  - Each point improvement in physical functioning associated with a 8% decrease in likelihood of leaving

(Other comparisons limited by small #s)

**JOURNAL OF APPLIED OCCUPATIONAL  
SCIENCES**

G. van Thienen en T. Spee

**Health Effects of construction materials  
and construction products**

**Tijdschrift voor toegepaste  
Arbowetenschap  
Jaargang 21**

**2008 • 1**

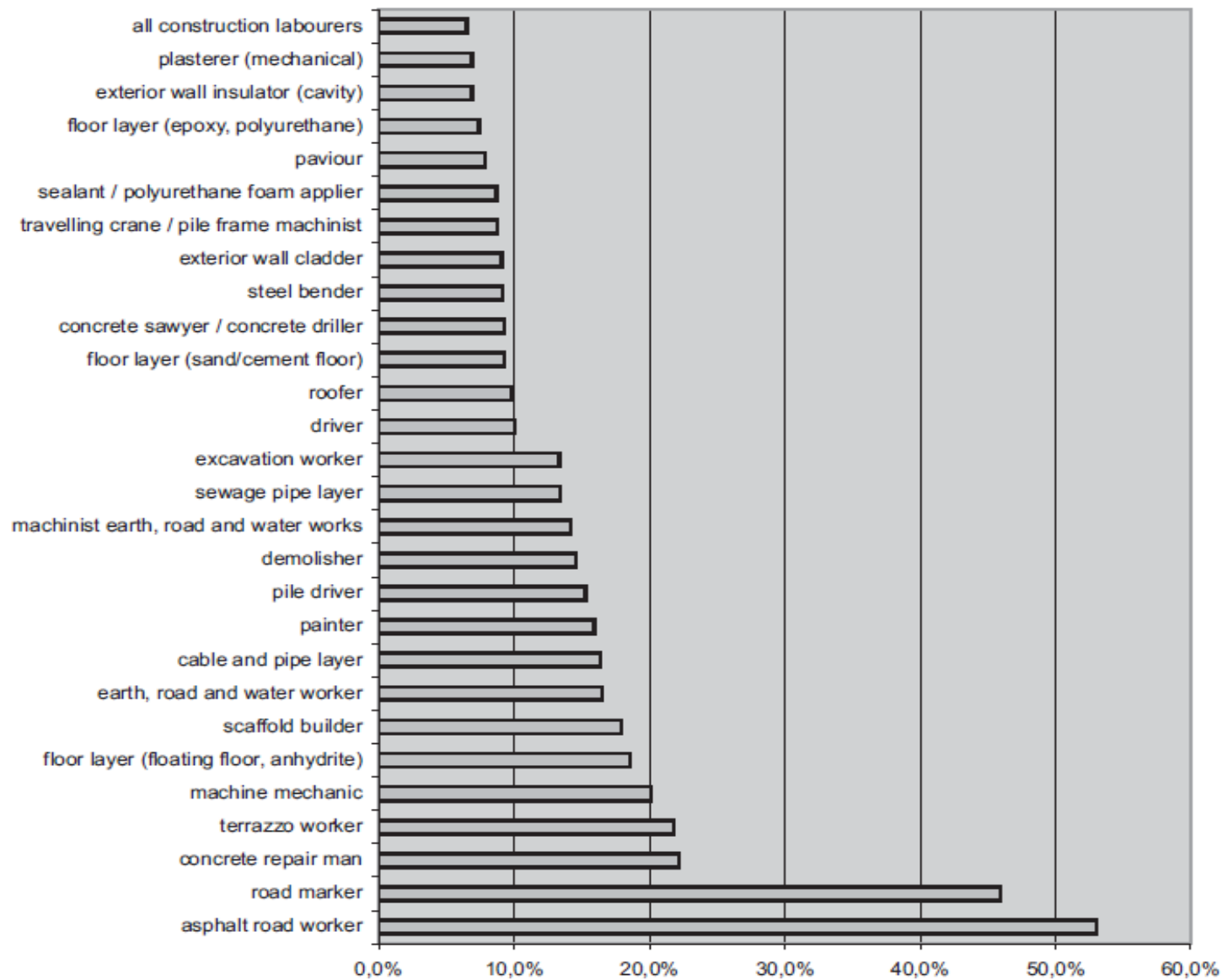


Figure 1: Complaints about vapours or gases

*Table 2: The typical composition of the starting materials for portland cement manufacture (Winder and Carmody, 2002).*

Ingredient	Formula	Percentage
Calcium oxide (lime)	CaO	64
Silicium dioxide (silica)	SiO <sub>2</sub>	21
Aluminium oxide	Al <sub>2</sub> O <sub>3</sub>	5.8
Iron oxide	FeO <sub>3</sub>	2.9
Magnesium oxide	MgO	2.5
Sulfur dioxide	SO <sub>3</sub>	1.7
Hexavalent chromium	Cr(VI)	0.002
Alkali oxides		1.4



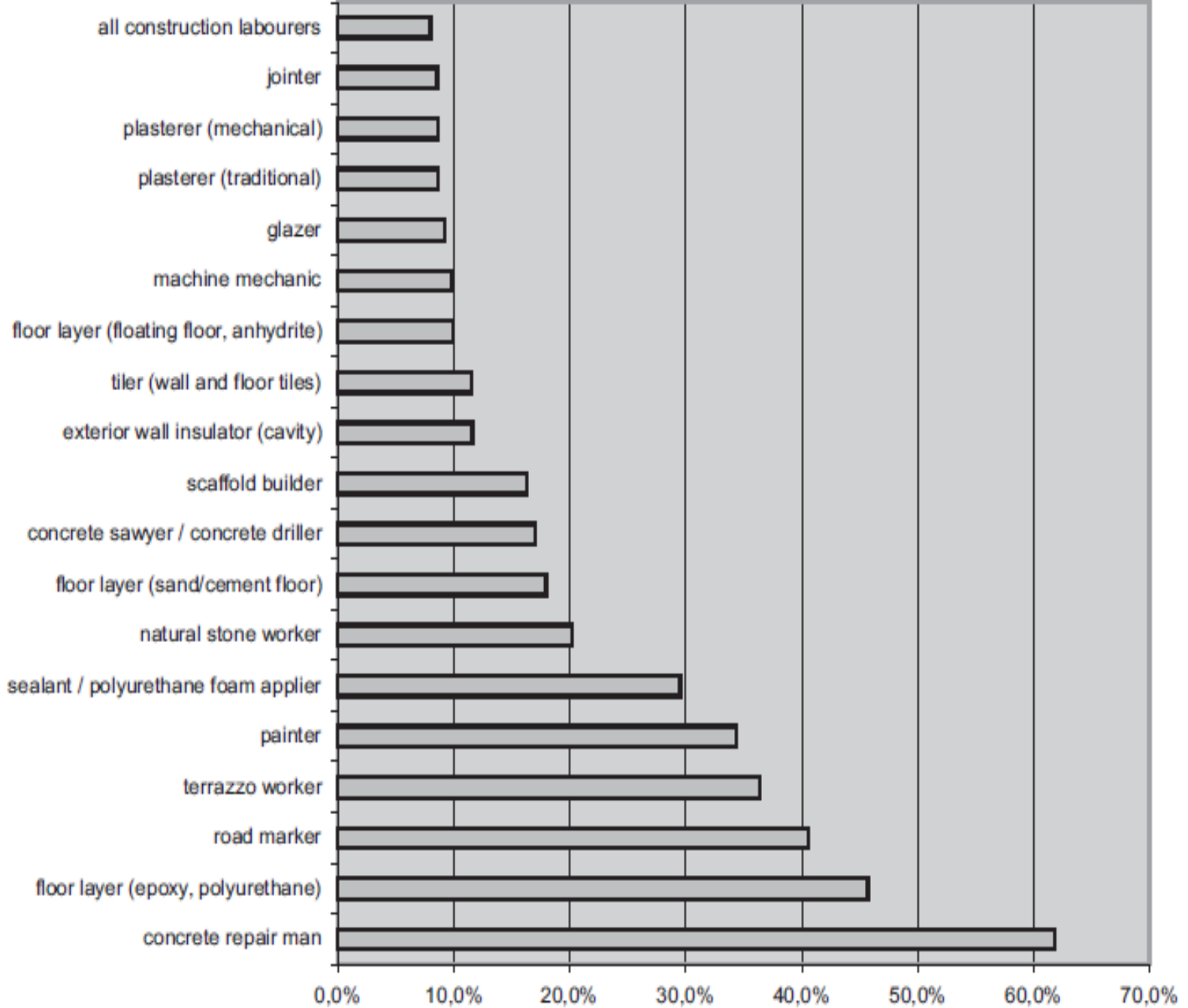


Figure 3: Complaints about chemicals

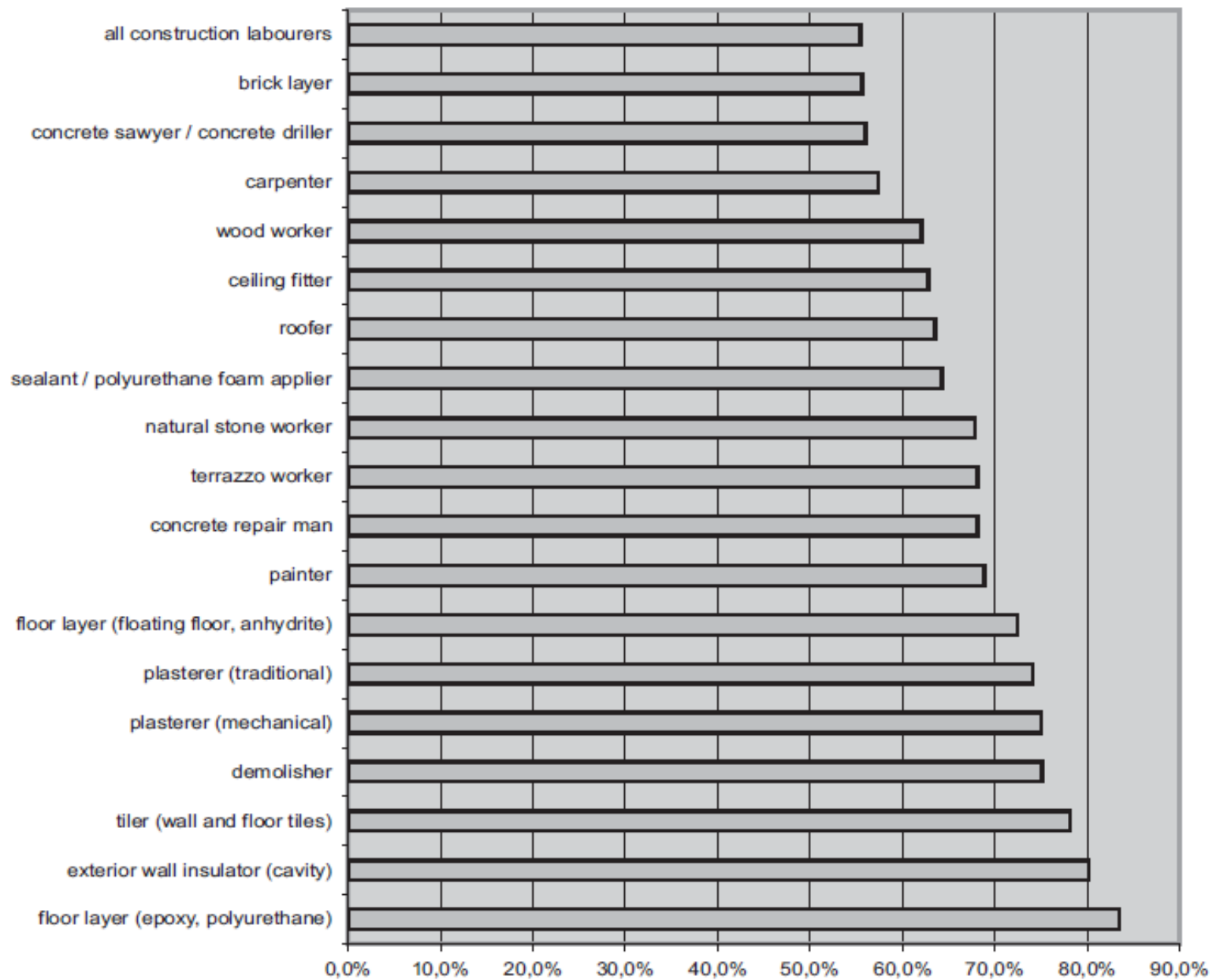
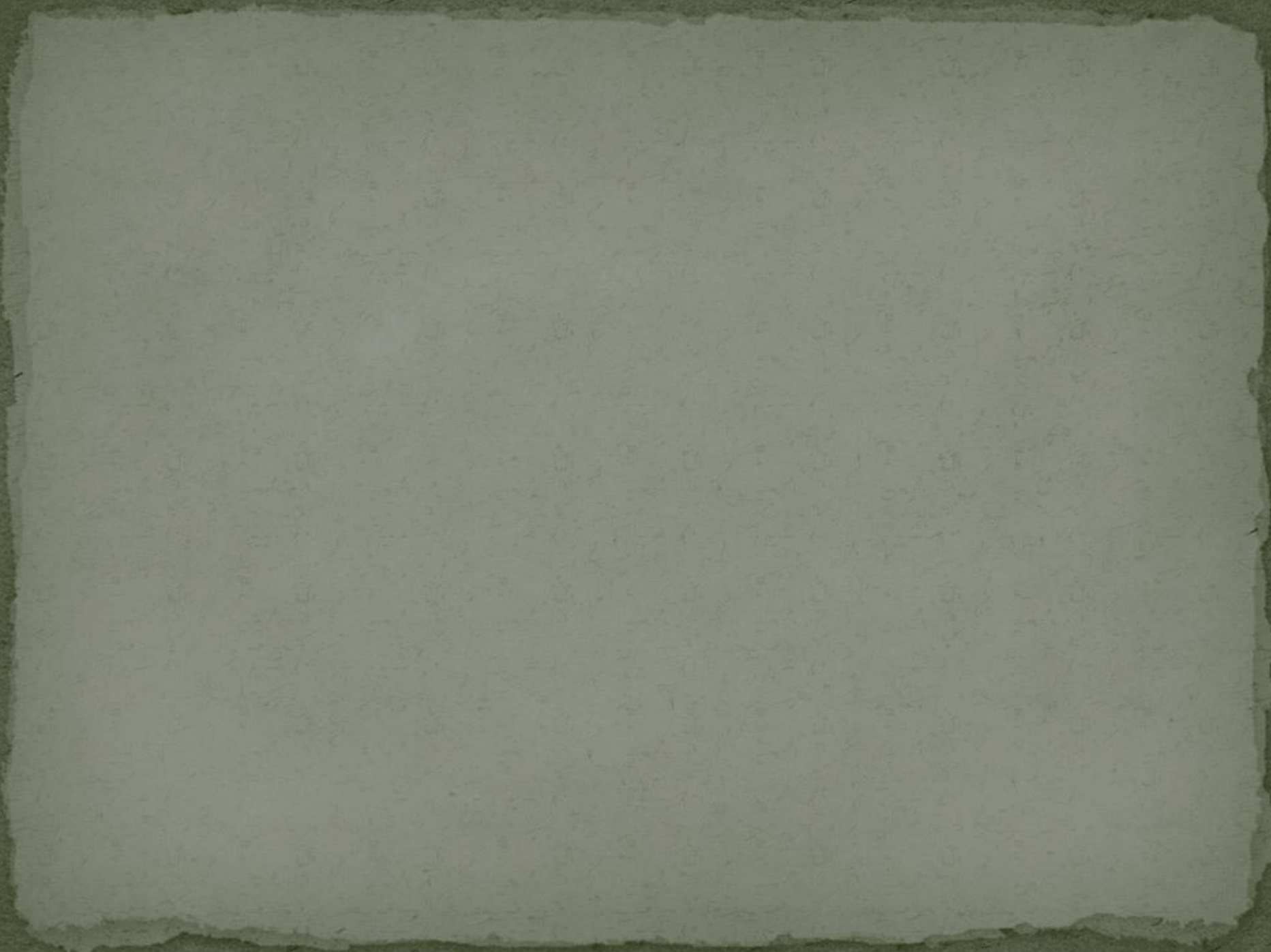


Figure 4: Complaints about dust



# Summary

- Construction work breaks up hard material & is inherently injurious to workers leading to early disability
- Construction work is increasing as people continue to migrate to the large cities looking for work
- Disabled workers without disability benefits or adequate vocational rehabilitation slide into poverty along with their dependants

# What can be done?

- Fund education and training of workers and employers in proper work practices and provision of safety and personal protective equipment
- Educate clinicians in recognition, treatment and prevention of construction related musculoskeletal injuries
- Educate appropriate personnel in application of industrial hygiene and ergonomic hazard control methods

## To be done...

- Develop vocational rehabilitation for injured construction workers
- Recruit employers to preferentially prematurely disabled construction workers who for appropriate work placement
- Issuance of a position statement on the need for funding to accomplish these goals and the expected impact

"Yes, yes... but who really cares about construction workers' health?"

- Today, one-third of the world's population depend on remittances from migrant workers for a significant part of their livelihood. A growing part of this migration is within countries, from rural areas to the burgeoning industrial centers...

*24 October 2011 CR Statement on the Safety and Health of Migrant Labour*

The health and safety needs that arise from migrancy affect workers, workers' families and workers' communities. They come in the form of abuse, malnutrition, transmission of infectious diseases and mental disorders.

*24 October 2011 CR Statement on the Safety and Health of Migrant Labour*



# Construction & migrant workers

- An estimated one third of world's population depends on remittances from migrant workers...of which about 75% is internal (within country) migration...and about 50% of these workers are employed in seasonal work such as construction or agricultural work.
- *24 October 2011 CR Statement on the Safety and Health of Migrant Labour*

# Morbidity, disability, premature death...

There are organizations that focus on migrant workers from the perspective of economics or human rights, but none focuses on the public health needs that arise from migrant labour. This is surprising given that there can be little doubt that these needs are a significant source of morbidity, disability and premature death.

# Tekton

- The Greek word tekton, usually translated as carpenter in the New Testament, can also refer to a builder, construction laborer, craftsman, or even stone mason.

<sup>54</sup> Coming to his hometown, he began teaching the people in their synagogue, and they were amazed. “Where did this man get this wisdom and these miraculous powers?” they asked.

<sup>55</sup> **“Isn’t this the carpenter’s son? Isn’t his mother’s name Mary, and aren’t his brothers James, Joseph, Simon and Judas?”**

<sup>56</sup> Aren’t all his sisters with us? Where then did this man get all these things?”

<sup>45</sup> Philip found Nathanael and told him, “We have found the one Moses wrote about in the Law, and about whom the prophets also wrote—Jesus of Nazareth, the son of Joseph.”

<sup>46</sup> **“Nazareth! Can anything good come from there?”** Nathanael asked.

“Come and see,” said Philip.

<sup>47</sup> When Jesus saw Nathanael approaching, he said of him, “Here truly is an Israelite in whom there is no deceit.”

# Iudaea Province in the First Century











[http://www.welcometohosanna.com/LIFE\\_OF\\_JESUS/013\\_LearningATrade.htm](http://www.welcometohosanna.com/LIFE_OF_JESUS/013_LearningATrade.htm)

