

# Occupational Injury Disparities in the US Hotel Industry\*

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**Background** Hotel employees have higher rates of occupational injury and sustain more severe injuries than most other service workers.

**Method** OSHA log incidents from five unionized hotel companies for a three-year period were analyzed to estimate injury rates by job, company, and demographic characteristics. Room cleaning work, known to be physically hazardous, was of particular concern.

**Results** A total of 2,865 injuries were reported during 55,327 worker-years of observation. The overall injury rate was 5.2 injuries per 100 worker-years. The rate was highest for housekeepers (7.9), Hispanic housekeepers (10.6), and about double in three companies versus two others. Acute trauma rates were highest in kitchen workers (4.0/100) and housekeepers (3.9/100); housekeepers also had the highest rate of musculoskeletal disorders (3.2/100). Age, being female or Hispanic, job title, and company were all independently associated with injury risk.

**Conclusion** Sex- and ethnicity-based disparities in injury rates were only partially due to the type of job held and the company in which the work was performed. *Am. J. Ind. Med.* 53:116–125, 2010. © 2009 Wiley-Liss, Inc.

**KEY WORDS:** occupational injury; hotel workers; housekeepers; musculoskeletal disorders; health disparities

## BACKGROUND

Health disparities between the sexes and between racial/ethnic groups have been documented for a wide spectrum of diseases [Satcher and Higginbotham, 2008] but research on disparities in the rates of injuries and diseases occurring in the workplace is still emerging. Recent studies have shown that Hispanic workers have the highest rate of fatal and non-fatal OSHA-reported injuries in the US, followed by black non-Hispanic workers [Richardson et al., 2003; USBLS, 2007a]. Among agricultural and hospital workers, a disproportionate burden of occupational injury is carried by women, African Americans, and Latinos [McGwin et al., 2000; Simpson and Severson, 2000; McCurdy et al., 2003]. Elevated risks among these groups are partially explained by disproportionate employment in high-risk industries and occupations, but there may also be disparities within the same industry or job classification, perhaps resulting from sex, racial, or ethnic discrimination and other factors.

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Within the US hospitality industry, hotels, and motels employ 1.8 million workers [USBLS, 2007b]. In the United States, hotel workers are nearly 40% more likely to be injured on the job than all other service sector workers. Hotel workers also sustain more severe injuries resulting in more days off work, more job transfers, and more medically restricted work compared to other employees in the hospitality industry [USBLS, 2005].

Approximately 25% of hotel workers are employed in housekeeping departments [USBLS, 2007b]. Housekeepers constitute the single largest occupational group in the hotel industry and include room cleaners (maids or room attendants) and housemen. Many room attendants are immigrant or minority women, with a majority being either Asian, Latin American, or African American [Wial and Rickert, 2002]. Thus, they belong to several groups that have been repeatedly identified as having excessive occupational risks: women [Stellman, 1999; NIOSH, 2002; Kauppinen et al., 2003; Messing, 2004; Treaster and Burr, 2004], immigrants [Improving Health and Safety Conditions for California's Immigrant Workers, 2002], ethnic/racial minorities [Frumkin et al., 1999], and low-wage workers [Frumkin and Pransky, 1999]. However, very little is known about occupational injuries among hotel housekeepers; the US Bureau of Labor Statistics (BLS) does not provide rates of occupational injury and illness for single occupations. Among Las Vegas hotel room cleaners, the prevalence of self-reported pain associated with work was 75% during the previous year [Scherzer et al., 2005]; 63% had had severe or very severe low back pain just in the prior month [Krause et al., 2005].

In 1996, the first National Institute for Occupational Safety and Health (NIOSH) research agenda ("NORA") called for innovative occupational health research to determine the extent and severity of disease and injury among special worker populations [NIOSH, 1996]. Ten years later, the revised NORA research agenda targeted the service sector, which accounts for 80% of the US workforce. Hotel workers have been repeatedly identified as an under-researched population with significant problems such as musculoskeletal injuries; even less is known about dishwashers, cooks, and other food service workers.

This study analyzes the rates of OSHA-reported injury within the hotel industry for four leading hotel job categories (hotel housekeepers, cooks/kitchen workers, stewards/dishwashers, and banquet servers), and examines disparities in injury risk by race/ethnicity and sex.

## METHODS

### Study Population

Institutional Review Board approval was obtained from the University of Illinois at Chicago under the "exempt" classification. The study population consisted of non-

supervisory hotel workers employed for a minimum of 2 weeks in at least 1 year during the study period of 2003–2005, at full-service hotels operated by the five largest hotel companies in the United States. For this study, full-service hotels are defined as properties with at least 100 guest rooms and with a minimum of 10,000 square feet of conference space. These criteria were intended to increase the likelihood that job classifications and workplace exposures to ergonomic and safety hazards would be similar. Luxury chains were excluded because the design and pace of work varies significantly at these properties.

The five companies operate several hotel chains that together make up over 70% of the full-service hotel rooms nationwide, with each company establishing its own standards of service. According to information found on the companies' public websites in February 2007, these companies operate 964 hotel properties in the US that meet the study's definition of full-service hotels. UNITE HERE, the largest hospitality workers union in North America, represents workers at many of these hotels.

### Hotel Sampling

Upon request from the union, 71 of the hotels with collectively bargained contracts provided data, which could be utilized for this study. The two largest companies represented an unbalanced proportion of the sample, so a random number generator [Research Randomizer, 1997–2008] was used to select 12 hotels from each of these two. All hotels from the three other companies were included in the data analysis. This produced a sample of 50 hotels with sufficient data from 2003 to 2004 and 45 from 2005 (Table I). Study hotels were dispersed across the country with concentrations in large urban areas including New York City, Chicago, San Francisco, Los Angeles, and Honolulu.

### Job Classifications

Job titles are numerous within hotel departments and vary from employer to employer. The authors in collaboration with

**TABLE I.** Hotel Company Distributions of US Full-Service Hotels and Hotels in the Study Sample

Company	Full-service hotels		Study sample	
	No.	%	No.	%
Company 1	334	35	12	24
Company 2	95	10	12	24
Company 3	10	1	5	10
Company 4	319	33	9	18
Company 5	206	21	12	24
Totals	964	100	50	100

experienced union field staff familiar with the specific job titles, grouped the jobs that share similar tasks and exposures to workplace hazards (e.g., “dishwasher” and “pot washer,” “housekeeping attendant” and “room attendant”). Five key job categories were created—housekeepers, banquet servers, stewards/dishwashers, cooks/kitchen workers, and “other.” Housekeepers perform guest room cleaning including making beds, vacuuming floors, cleaning shower walls and bathroom fixtures, dusting furniture, and pushing carts. Banquet servers provide food service such as carrying plated food from the kitchens to the customers, dispensing drinks, and supplying food to cafeteria and buffet services. Stewards retrieve, sort, load/lift, unload, and return dishes, glasses, pots, utensils and silverware, and provide these items by pushing carts to cafeteria and buffet lines. In addition, stewards maintain cleanliness in food preparation areas. Cooks lift, weigh, measure, mix, cut and grind food ingredients; they cook these ingredients and compose salads and other food for serving [USBLS Occupational Outlook Handbook, 2008–2009]. All remaining jobs were categorized as “other.” Jobs classified as “other” were those that did not share similar job tasks or exposures with the other four key job categories. These included lobby attendant, cashier, door person, host/hostess, among others.

## Database Creation

Employee rosters and OSHA 300 log data were provided to the union by the five hotel companies for the period 2003–2005. The employee rosters provided employee name, department, job title, date of birth, date of hire, termination date, sex, and race/ethnicity. Race/ethnicity was defined by the employer based on employee self-report as one of the following five mutually exclusive categories: American Indian, Asian, Black, Hispanic, and White.

The OSHA 300 logs included employee name, department name or location where injury event occurred, job title, date of injury, injury description, days away from work, and days on restricted duty. These data were matched to the employee rosters using employee name and date of birth. The final dataset included a single record for each employee. Up to three injury or illness incidents during the 3-year study period were abstracted for each individual. Employee names were removed from all datasets before data analysis began. A record number was assigned to each injury incident and was subsequently used in all data analyses.

## Injury Coding

Nature of injury data was constructed from the injury description section of OSHA log entries and were grouped by the authors into four categories: musculoskeletal disorders (MSDs), acute trauma injuries, other, and not classifiable. MSDs were coded according to the US BLS definition: “an

injury or disorder of the muscles, nerves, tendons, joints, cartilage, or spinal discs. MSDs do not include disorders caused by slips, trips, falls, motor vehicle accidents, or similar accidents” [USBLS, 2007c]. Back pain or pain at other body locations and strain or sprain injuries were coded as MSDs unless the entry referenced stairs or ladders, or the employer-reported description of the injury referenced a slip or fall. “Acute trauma” cases included contusions, fractures, lacerations, heat burns, and sprain or strain injuries with evidence of an injury mechanism that involves acute contact with outside objects (e.g., hit by, struck against) that were not otherwise categorized as an MSD. “Other” incidents included chemical exposures, foreign bodies in the eye, and all other cases. “Not classifiable” injuries had insufficient information to determine the nature of injury.

## Statistical Analysis

All data were analyzed using SAS (SAS v. 9.1, 2007. SAS Institute, Cary, NC) and Excel (Microsoft Office 2003, Seattle, Washington). Injury rates and risk ratios were calculated to compare the injury experience of hotel workers by sex, race/ethnicity, and job title for the entire study population and by company. The denominator for all calculations was calculated from the number of workers who met the inclusion criterion of employment for a minimum of 2 weeks during each year of study. As individual employees may be counted in more than one study year, the denominators represent total worker-years of observation. The available data did not provide information on part-time/full-time status. The race and ethnicity characterization was left blank on the employee rosters for <1% of the sample. Therefore, this race/ethnicity “not classified” group was excluded from all data analyses.

Age was computed by subtracting birth date from the last day of the year being analyzed (e.g., in 2003, Age = 12/31/2003 – birth date) divided by 365.25. Only employees aged 18–70 years were included in the analysis. A job tenure variable was similarly created by subtracting termination date from hiring date.

Risk ratios were calculated using the following referent groups: males, whites, and “other” job title. For analyses by hotel company, Company 1 was chosen as the referent group on the basis of the level of union presence at its hotels, thereby a measure of labor and management’s negotiation of working conditions.

Because we had injury count data and repeated measures (multiple years per subject), we performed multivariable Poisson regression modeling (Loomis et al. 2005) with generalized estimating equations (GEE) using SAS Proc Genmod with a Poisson distribution, unstructured correlations and log link to estimate relative risk. Regression models included age (18–27 years, 28–37 years, 48–57 years, 58–70 years), sex, race/ethnicity, job title, job tenure (0–10

**TABLE II.** Demographic Breakdown of Hotel Workers\* Employed 2003–2005 in 50 Unionized Full-Service Hotels (n = 55,327)

	Total		Housekeeper		Banquet server		Steward/dishwasher		Cook/kitchen worker		Other jobs	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Male	31,135	56.4	269	2.3	3,406	66.8	2,948	85.1	3,269	72.0	20,280	69.2
Female	24,048	43.6	11,320	97.7	1,693	33.2	518	14.9	1,271	28.0	9,008	30.8
White	11,187	20.3	982	8.4	2,137	36.8	286	8.1	882	19.3	6,898	23.3
Asian	13,352	24.2	3,109	26.7	909	15.6	594	16.9	1,202	26.3	7,538	25.4
Black	12,252	22.2	3,439	29.5	712	12.3	962	27.3	872	19.0	6,267	21.1
Hispanic	18,392	33.3	4,118	35.3	2,047	35.3	1,678	47.7	1,622	35.4	8,927	30.1
American Indian	144	<1	12	<1	32	<1	7	<1	10	<1	83	<1
Total (%) <sup>a</sup>	55,327	100.0	11,660	21.1	5,837	10.5	3,527	6.4	4,588	8.3	29,713	53.7

\*Total person-years observed, not total employees.

<sup>a</sup>Total excludes race “not specified” (<1% of total).

years, 11–20 years, 21–30 years, 31–40 years, 41–52 years), and hotel company as independent variables. In addition, cross tabulation and regression modeling were performed within the subset of female housekeepers. Similar analyses were not conducted within other subsets of other job classifications; female housekeepers were a particularly large subset.

## RESULTS

There were a total of 55,327 worker-years of observation in the sample. Fifty-six percent of the sample was male and 44% female (Table II). By job title, 21% of the employees were housekeepers, 11% were banquet servers, 6% were stewards/dishwashers, 8% were cooks/kitchen workers, and 54% had other jobs. Most of the workers were non-white (Black, Asian, Hispanic), comprising 80% of the sample. American Indians and male housekeepers were very few in number. Hispanics comprised the largest proportion of three job titles: housekeepers, stewards, and cooks. The mean age of the study population was 44.5 years (SD 13.5). The mean job tenure was 9.61 years (SD 8.8).

There were 2,865 injuries recorded on the OSHA 300 logs in 2003–2005 (Table III), for an injury rate of 5.2 injuries per 100 worker-years. Acute trauma accounted for 52% of the injuries, 39% were musculoskeletal injuries, and 9% were “other” or “not classifiable.” Women workers had a higher overall injury rate (6.3) than men (4.3).

Housekeepers had the highest overall injury rate and the highest rate of MSDs, at 7.9 and 3.2 per 100 workers, respectively. Acute trauma rates were highest in cooks/kitchen workers and housekeepers. Banquet servers had the lowest injury rates. Excluding the six injuries among American Indians, among housekeepers (Table IV), Hispanic workers had the highest overall injury rate at 10.6, the highest rate of MSDs (4.4), and the highest rate of acute traumas

(4.9). Among cooks (not shown), Asians had the highest rate: 8.4% for all injuries, with 7.9% among males and 10.1% among females.

In each job title of interest (housekeepers, etc.), injuries of the upper extremity were the most common, followed by back injuries and lower extremity injuries. By nature of injury, over 40% of MSDs involved the back, 22% distal upper extremities, and 13% the shoulder. In contrast, 44% of acute traumatic incidents were to the upper extremity, especially the hand.

Women workers overall and Asian and Hispanic men were about 1.5 times more likely to have been injured than their referent groups (Table V). Female American Indians fared the worst, although the number of injuries were so few that the confidence intervals are relatively wide. Hispanic women had almost double the risk of injury than their white female counterparts. Within job categories, non-white female cooks/kitchen workers fared poorly compared to their white counterparts as did non-white male banquet servers. Female housekeepers had about three times the risk of injury than male housekeepers, and Hispanic housekeepers were 70% more likely to be injured than white female housekeepers.

When analyzed by hotel company, the overall injury rates differed markedly by company, with companies 2, 3, and 4 in particular having almost twice the rate of Company 1 (Table VI). Company 2 had the highest rate of injury for housekeepers (10.4). This overall effect was consistent in analysis by injury type, with the lowest rates for both MSDs and acute trauma injuries in Company 1. These same patterns by company were also evident for key demographic groups within the four key jobs. Of the 15 job/race/sex groups with sufficient cases for comparison, Companies 2 and 3 had the highest injury rates for five of them and Company 4 had almost as many. Company 1 had only one such group, and Company 5 had none.



**TABLE III.** Injury Incidence and Rates\* for the Hotel Worker Study Population, by Sex and Job Title, 2003–2005

	Total		Male		Female		Housekeeper		Banquet server		Steward/dishwasher		Cook/kitchen worker		Other jobs <sup>a</sup>	
	Inj no.	Rate	Inj no.	Rate	Inj no.	Rate	Inj no.	Rate	Inj no.	Rate	Inj no.	Rate	Inj no.	Rate	Inj no.	Rate
MSDs	1,117	2.02	525	1.68	592	2.46	368	3.16	63	1.08	70	1.99	80	1.74	536	1.82
Acute trauma	1,497	2.71	709	2.28	788	3.28	456	3.91	94	1.62	116	3.30	182	3.98	649	2.19
Other injuries	251	0.45	110	0.35	141	0.59	93	0.80	7	0.12	24	0.68	12	0.26	115	3.88
Total injuries	2,865	5.19	1,344	4.32	1,521	6.32	917	7.87	164	2.82	210	5.97	274	5.99	1,300	4.92

\*Injury rate is number of cases per 100 person-years.

<sup>a</sup>Injuries that were “not classifiable” were collapsed into “other” jobs.

The regression analyses of all hotel workers (Table VII) confirmed the higher injury risk for housekeepers and Hispanic workers, and the lower risk in Company 1, after adjusting for demographic characteristics. Comparison of univariable and multivariable models showed that some of the apparent excess risk in Black, Hispanic, and Asian workers was reduced after adjustment for job title and hotel company. This was consistent with the fact that Blacks were most likely (30%), and Whites least likely (8%), to be employed as housekeepers rather than in other jobs, and that Company 1 had fewer Black and Asian employees. Job tenure had a slight inverted-U effect (risk was highest for 21–30 years of seniority and then decreased) but it was dropped from the multivariable models because the coefficient was very small, the confidence intervals wide, and the type 3 (GEE) score statistics indicated that the variable did not contribute any explanatory power. Among female housekeepers, the predictors of injury were quite similar to those for all hotel workers, with increased risk for being Hispanic or employment at Companies 2, 3, and 4.

## DISCUSSION

Several studies have shown that cleaning tasks in various industries demand a high level of physical effort, including high aerobic strain and repetitive movements [Hagner and Hagberg, 1989]; high static muscular loads [Milburn and Barrett, 1999]; high frequency of unsatisfactory postures such as stooping and crouching [Woods et al., 1999]; and subjective experience of strenuous work [Sogaard et al., 1996; Seifert and Messing, 2006]. In hotel workers specifically, guest room cleaning work is marked by time pressure, low job control, low wages, increasing use of contingent employees without job security, and few opportunities for career advancement [Parker, 1999; Lee and Krause, 2002; Wial and Rickert, 2002; Bernhardt et al., 2003; Krause et al., 2005]. The present study is one of the first to quantify the incidence, rates, and risk of injury among hotel workers.

We found that women were more often injured than men and that housekeepers in general suffered the highest injury rate among the four job titles of interest. Moreover, our results show an alarming injury rate among housekeepers in general and Hispanic housekeepers in particular. While close to half of the total workers here are women, they were heavily grouped in the housekeeping category, a set of jobs with very high physical demands. This study strengthens the evidence that job gender stereotyping within the American economy remains a potent defining factor for the workforce and potentially a substantial risk factor for injury [Mergler, 1995; Messing et al., 1998, 2003; Punnett and Herbert, 2000].

Socioeconomic status (SES) in general, and income inequality, education, and job-specific occupational hazards in particular, have all been proposed as possible explanations for racial/ethnic as well as gender health disparities. There is

**TABLE IV.** Injury Incidence and Rates\* for Housekeepers by Race/Ethnicity, 2003–2005

	All injuries		MSDs		Acute trauma		Other/not classifiable	
	Inj no.	Rate	Inj no.	Rate	Inj no.	Rate	Inj no.	Rate
Asian	228	7.33	102	3.28	106	3.41	20	0.64
Black	189	5.50	58	1.69	113	3.29	18	0.52
Hispanic	435	10.56	183	4.44	203	4.93	49	1.19
White	62	6.31	24	2.44	32	3.26	6	0.61
American Indian	6	50.00	1	8.33	5	41.67	None	
Total <sup>a</sup>	920	7.89	368	3.16	459	3.94	93	0.80

\*Injury rate is number of cases per 100 person-years.

<sup>a</sup>Total excludes race "not specified" (<1% of total).

consistent epidemiologic evidence that low status jobs are associated with a high burden of disease, injury, and disability [Robinson, 1989; Krause et al., 1997, 2001; Amick et al., 1998; Borg and Kristensen, 2000; Pransky et al., 2000; Berkman and Kawachi, 2002; d'Errico et al., 2007]. This burden falls disproportionately on workers who are multiply disadvantaged in society and who have been under-represented and under-served in occupational health research. Female immigrant cleaners are a typical example of a minority population at the low end of the well-established SES gradient.

As yet, there has been no evaluation of the causes of differential injury rates by race/ethnicity within job title in this industry. One must question whether discrimination in the treatment of such workers—in the form of disproportionate assignment to high-risk jobs, refusal to fix unsafe conditions, or workers' disempowerment—resulting in unwillingness to speak up about such conditions, is at fault. As Murray [2003] noted, previous studies have observed informal systems of work assignments to non-white workers resulting in greater exposures to the hazards therein. Moreover, US BLS has already found that disproportionate employment of Hispanics in specific jobs is not associated with increased risk of injury after controlling for such employment patterns [Richardson et al., 2003]. In essence, race/ethnicity itself is not an indicator of increased risk.

The injury rate for the workers in this sample was 5.19 per 100 workers. For 2004, the US BLS reported a rate of 5.8 per 100 FTEs in hotel workers and 4.2 per 100 FTEs in the service sector overall. The lower overall injury rate reported in our sample may be due to the inability to identify the proportion of part time workers in this sample or that unionized employees work under conditions defined by collective bargaining agreements, which are intended to improve workplace safety. The study sample included only unionized workers, whereas the majority of US hotel employees do not belong to unions. Since unions function as the bargaining agent between the employer and the employee, it is likely that non-unionized hotels, in which

workers do not have a formal means to gain better working conditions, would have even higher injury rates than those reported in this study. Further, it is possible that hotels not providing data were those at which workplace safety is less of a priority and which have higher injury rates than those reported here.

These results also need to be seen in the context of the tendency of many workers not to report their injuries, especially if they are non-unionized, immigrants, or otherwise politically vulnerable [Azaroff et al., 2002, 2004; Brown et al., 2002; Scherzer et al., 2005]. Non-reporting of injuries may be due to language barriers, fear of retaliation, or lack of understanding of legal rights under Workers Compensation laws and OSHA standards. Although our data represent unionized workers who reported their injuries, the results may still represent an under-estimation of the true injury risk.

Other possible limitations to this study include quality of the data, coding, and job grouping errors. Injury data obtained from OSHA 300 logs may have contained inaccuracies. The individual responsible for completing these logs varies by workplace and is not always well trained in correct recording procedures. There may well be systematic differential approaches to OSHA 300 log completion by different hotel companies. Nevertheless, we saw no evidence of frequent recording errors or systemic bias in recording through regular quality control checks as well as consultations with experts on the coding and grouping criteria. Although the high rate of acute injuries in housekeepers may suggest coding errors, the OSHA logs frequently included event/exposure data such as contact with furniture, tripping over sheets, slips in bathtubs, etc. Furthermore, coding error is possible since some acute injuries in housekeeping may have been MSDs. However, the patterns of injury we found are also seen in US BLS data.

The hotels in this study sample were included based on number of rooms and size of meeting space in order to ensure similarity in job task burden among workers in the sample. Working conditions in full-service hotels are determined and standardized in major part by corporate-level policies such as

**TABLE V.** Injury Rate Ratios\* for the Hotel Worker Study Population by Job Title, Sex, and Race/Ethnicity, 2003–2005

Job title	Males						Females					
	All females			American Indian			Asian			Hispanic		
	# Inj	Rate	RR (95% CI)	# Inj	Rate	RR (95% CI)	# Inj	Rate	RR (95% CI)	# Inj	Rate	RR (95% CI)
All hotel workers	211	5.47	<b>1.46</b> (1.35–1.57)	0.41 (0.06–2.87)	<b>1.52</b> (1.28–1.82)	1.07 (0.87–1.32)	<b>1.54</b> (1.30–1.82)	<b>2.19</b> (1.08–4.46)	<b>1.39</b> (1.15–1.67)	1.14 (0.94–1.38)	1.91 (1.6–2.27)	<b>1.91</b> (1.6–2.27)
Housekeepers	5	n.a.	<b>3.19</b> (1.53–6.64)	n.a.	n.a.	n.a.	n.a.	<b>4.00</b> (1.65–9.67)	1.19 (0.87–1.62)	0.87 (0.63–1.20)	<b>1.70</b> (1.26–2.29)	<b>1.70</b> (1.26–2.29)
Banquet servers			1.38 (1.00–1.89)	n.a.	1.65 (n.a.)	1.87 (n.a.)	2.02 (n.a.)	n.a.	0.66 (n.a.)	1.20 (n.a.)	1.14 (n.a.)	1.14 (n.a.)
Stewards/ dishwasher			1.42 (1.00–1.97)	n.a.	1.29 (n.a.)	1.46 (n.a.)	1.78 (n.a.)	n.a.	n.a.	0.42 (n.a.)	0.45 (n.a.)	0.45 (n.a.)
Cook/kitchen worker			<b>1.34</b> (1.04–1.72)	n.a.	1.42 (n.a.)	0.51 (n.a.)	0.89 (n.a.)	n.a.	2.77 (n.a.)	2.20 (n.a.)	1.94 (n.a.)	1.94 (n.a.)
Other workers			1.05 (0.93–1.19)	0.75 (0.11–5.21)	<b>1.39</b> (1.12–1.73)	0.95 (0.74–1.22)	<b>1.48</b> (1.21–1.81)	1.88 (0.70–5.09)	1.11 (0.82–1.50)	1.00 (0.73–1.37)	<b>1.44</b> (1.08–1.93)	<b>1.44</b> (1.08–1.93)

n.a., insufficient data.

\*Referent groups: Males are referent group for females; white males are referent group for American Indian, Asian, Black, and Hispanic males; white females are the referent group for American Indian, Asian, Black, and Hispanic females. Statistically significant results are shown in bold.

**TABLE VI.** Injury Incidence Rate\*, and Rate Ratio for the Hotel Worker Study Population, by Job Title and Hotel Company, 2003–2005

Job titles	Company 1 <sup>a</sup>				Company 2				Company 3				Company 4				Company 5			
	# Inj	Rate	# Inj	Rate	# Inj	Rate	RR (95% CI)	# Inj	Rate	# Inj	Rate	RR (95% CI)	# Inj	Rate	RR (95% CI)	# Inj	Rate	RR (95% CI)	# Inj	Rate
Housekeeper	211	5.47	276	10.36			<b>1.93</b> (1.59–2.34)	86	9.67			<b>1.78</b> (1.37–2.32)	211	9.44	<b>1.74</b> (1.41–2.13)	135	6.18	<b>1.13</b> (0.89–1.43)		
Banquet Server	5	n.a.	56	3.69			n.a.	14	3.97			n.a.	69	4.33	n.a.	20	4.25	n.a.		
Steward/ dishwasher	51	4.63	60	7.15			<b>1.55</b> (1.04–2.31)	32	11.19			<b>2.48</b> (1.48–4.14)	45	9.15	<b>1.99</b> (1.29–3.08)	22	2.60	<b>0.56</b> (0.34–.93)		
Cook/kitchen worker	47	3.90	88	7.48			<b>1.94</b> (1.35–2.79)	26	12.32			<b>3.29</b> (2.01–5.40)	59	6.54	<b>1.68</b> (1.15–2.46)	56	4.94	<b>1.27</b> (0.86–1.89)		
Other workers	258	2.72	317	5.72			<b>2.10</b> (1.77–2.50)	140	6.23			<b>2.31</b> (1.84–2.89)	354	5.54	<b>2.04</b> (1.72–2.42)	232	3.72	<b>1.37</b> (1.13–1.65)		
All jobs	572	3.26	797	6.79			<b>2.10</b> (1.87–2.36)	298	7.48			<b>2.33</b> (1.99–2.72)	738	6.36	<b>1.95</b> (1.74–2.20)	465	4.28	<b>1.31</b> (1.15–1.49)		

n.a., insufficient data.

\*Injury rate is the number of injuries per 100 person-years.

<sup>a</sup>Company 1 is the referent group for all other companies.

Statistically significant results are shown in bold.

**TABLE VII.** Regression Models of Injuries Per Year\* to US Unionized Hotel workers, 2003–2005: Risk Ratios and 95% Confidence Intervals

	Unadjusted models (all hotel workers)		Multivariable model (all hotel workers)		Multivariable model (all hotel workers)		Multivariable model (female housekeepers)	
	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI	Odds ratio	95% CI
Age	1.07	1.04–1.09	1.08	1.05–1.11	1.09	1.06–1.12	1.10	1.03–1.18
Job tenure	1.08	1.04–1.12						
Female	1.46	1.35–1.58	1.24	1.12–1.37	1.21	1.09–1.34		
American Indian	1.35	0.67–2.72	1.33	0.68–2.61	1.15	0.60–2.22	2.54	1.05–6.13
Asian	1.46	1.29–1.67	1.25	1.10–1.42	1.11	0.97–1.26	0.97	0.71–1.33
Black	1.15	1.00–1.32	0.97	0.84–1.11	0.85	0.74–0.98	0.75	0.54–1.03
Hispanic	1.70	1.50–1.92	1.50	1.33–1.70	1.42	1.26–1.61	1.50	1.11–2.02
Housekeeper	1.80	1.65–1.97	1.50	1.34–1.68	1.52	1.36–1.70		
Banquet server	0.64	0.54–0.77	0.60	0.50–0.72	0.56	0.47–0.67		
Steward/ dishwasher	1.37	1.17–1.61	1.30	1.11–1.53	1.31	1.12–1.54		
Cook/kitchen worker	1.38	1.20–1.58	1.34	1.17–1.54	1.31	1.15–1.51		
Company 2	2.10	1.87–2.36			2.17	1.94–2.44	1.94	1.59–2.35
Company 3	2.33	1.99–2.72			2.41	2.07–2.81	1.84	1.41–2.39
Company 4	1.95	1.74–2.20			2.06	1.83–2.32	1.74	1.41–2.14
Company 5	1.31	1.15–1.50			1.37	1.20–1.56	1.19	0.94–1.50

Male is the referent group for female; White is the referent group for Black, Hispanic, Asian, and American Indian; “Other jobs” is the referent group for housekeeper, banquet server, steward, and cook/kitchen worker; Company 1 is the referent group.

\* Up to three injuries per year per employee; denominators = 55,311 person-years of observation for all hotel workers and 11,375 person-years for female housekeepers.

job task lists and the use of branded products such as luxury beds. Hotels with fewer than 100 rooms would be less likely to have standardized room quotas, which might affect workload pressure and therefore injury risk among housekeepers. Thus, we believe that the inter- and intra-hotel variations in work tasks among job title groups are likely to be minimal in our sample of properties.

There were substantial and consistent differences in injury rates among the five companies. These differences persisted for all injuries, for injuries by job title, and by demographic groups. As this study sought to standardize job tasks between companies, this differential suggests the influence of management policies and practices, meaning that workplace intervention has a significant ability to modify the risks identified in this study. These marked differences between companies demonstrate the potential for sharp improvement by individual companies in injury rates. They also underscore the need for companies with high rates to investigate whether discriminatory workplace practices contribute to these disparities—in order to remedy the discrimination and reduce the injury risk accordingly.

## CONCLUSION

Injury rates for hotel workers are higher than those in the service sector as a whole. Characteristics that increased the

injury risk among the workers in our study included female sex, Hispanic ethnicity, housekeeper job title, and hotel company. Hispanic banquet servers had the highest risk amongst men, and American Indian housekeepers had the highest risk among women. Hispanic female housekeepers suffered more injuries than other female room cleaners. Immediate action is needed with respect to the control of hazards to housekeepers, especially those stressing the upper extremities, and to food service workers with respect to acute trauma. The ethnic, gender, and employer differentials deserve further exploration to adequately understand the interaction of social forces with ergonomic and safety hazards in the workplace. Large differences of injury rates between employers indicate a substantial potential for injury prevention in the hotel sector.

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