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The Increased Incidence on Mondays of Work-Related Sprains and Strains

Steven L. Shepherd, MPH
Bonnie J. LaFleur, MPH

Insurance-industry researchers have shown an increase on Mondays of lost-time sprain and strains said to be work-related, but thought to be fraudulent claims for off-the-job weekend injuries. We examined this issue among civilian employees of the Department of the Navy, using data from claims for injuries occurring between 1989 and 1994. We found that the rate of Monday sprains and strains significantly exceeded the expected rate and that such claims were significantly more likely to be made by claimants who were craftsmen and mechanics, who reported an injury to the back or trunk, who were supervisors, or who did not have college degrees. We estimate that 22% of claims for Monday-occurring sprains and strains are possibly fraudulent and that their cost to the Department of the Navy during the 6 years studied was $38 million. For the entire federal government, costs for such claims during this period may have exceeded $250 million.

Work-related injuries might be more likely at the beginning of the workweek for a variety of reasons. Workers on Mondays might be less attentive to risks; injuries deemed minor and not worth reporting at the end of the preceding week may have become problematic in the interim; and workers who have remained sedentary during the weekend may be more susceptible to injury upon resuming their work activities. Alternatively, rates of work-related injuries may appear elevated on Monday because of the reporting of injuries resulting from off-the-job weekend mishaps.

Economics may provide a motivating factor in the latter circumstance. Compared with injuries that occur off the job, injuries covered by workers' compensation are associated with wage-replacement payments and a generally higher level of medical expense coverage than is provided by typical accident or health insurance plans.[1] This discrepancy in benefits could tempt some people who suffer a weekend injury to misrepresent the event as job-related and to file a corresponding claim for workers' compensation on Monday.

Few if any studies in the occupational health or safety literature have examined (other than incidentally) day-by-day variations in injury rates over the course of the workweek. Within the insurance industry, however, two such studies have been described. Borba and Eisenberg-Haber analyzed randomly sampled claims data from private providers of workers' compensation insurance

From the Medical Information Systems and Operations Research Department, Naval Health Research Center, San Diego, Calif.

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Address correspondence to: Steven L. Shepherd, MPH, Medical Information Systems and Operations Research Department (Code 22), Naval Health Research Center, P.O. Box 85122, San Diego, CA 92186-5122.

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with respect to the occurrence of 152,000 lost-time sprains and strains, contusions, fractures, and lacerations.[1] Their premise was that among these four injury types, sprains and strains are the most easily concealable and their treatment most readily deferrable, and they therefore are the most likely to be reported as work-related and occurring on Mondays despite having truly happened on the weekend. They hypothesized that of all the sprains and strains occurring during the workweek, a disproportionately high percentage would be reported as occurring on Mondays and that this percentage would exceed the Monday-occurring percentages of contusions, fractures, and lacerations. Their results supported this hypothesis. Of all sprains and strains occurring during the workweek, 22.56% were said to have occurred on Monday, vs 20.81% of all contusions, 20.11% of all fractures, and 19.49% of all lacerations. These latter percentages were all significantly lower than the percentage for sprains and strains. Borba and Eisenberg-Haber further determined that 18% of all sprains and strains reported as occurring on Monday were likely to have been the result of off-the-job weekend injuries, and the annual cost to business for fraudulent Monday sprain and strain workers' compensation claims was estimated "conservatively" at between $175 million and $275 million.[1] These results are consistent with those from an earlier study by Smith, which used similar methodology and indicated that 9% of sprains and strains reported as occurring on Monday were attributable to weekend injuries (Smith RS. Mostly on Mondays: is workers' compensation covering off-the-job injuries? Report to the National Council on Compensation Insurance Conference on Economic Issues in Workers' Compensation, November 21, 1986).

Our principal goals in this study were twofold. First, we sought to determine whether these earlier findings could be replicated in a different work force. And second, we wished to investigate the possibility that various demographic or occupational factors might differentiate Monday sprain and strain claimants from those claiming similar injuries later in the week.

Method

Subjects and Data Sources

The Department of the Navy employs a large civilian work force in a diverse range of activities, from administration to health care to the construction of ships. These employees are covered by the Federal Employees' Compensation Act (FECA), which specifies the benefits payable by the federal government to those of its employees who sustain a work-related injury.[3,4] The act is administered by the Department of Labor's Office of Workers' Compensation Programs (OWCP). To obtain benefits or to record an incident that may later warrant benefits, employees are required to file a "Notice of Traumatic Injury" with OWCP. All injured employees are encouraged to file such forms, no matter how slight the injury.[5]

OWCP maintains computerized records of all claims filed and provides the Department of the Navy with annual copies of these records.[3] The data for this study were derived from OWCP's end-of-year tapes for the 6-year period 1989 to 1994. (Because OWCP's accounting year runs from July 1 to June 30, a named year refers to the 12 months ending in June of a given year. OWCP year 1989, for instance, refers to the period July 1, 1988, to June 30, 1989.) For each case, the available data include the date, nature (eg, sprain or strain), and anatomical location of the injury, as well as codes indicating whether the injury involved time lost from work and whether OWCP accepted the claim as meeting the criteria for benefit coverage.

Computerized personnel records for all civilian employees of the Department of the Navy during the same 6-year period were also available. These records include demographic information such as sex, race, and educational level, along with such job-related information as occupational title and performance ratings. Both the personnel and the OWCP data files contain social security numbers, and the two sets of files can be matched on this basis, thereby making it possible to ascertain the demographic and occupational status of individuals filing injury claims at or near the time of their injury. Over the 6 years of the study, the mean work-force size at midyear was 299,478.

Exposure Data

Borba and Eisenberg-Haber assumed that work force exposure time is spread evenly across the workweek.[1] For two reasons, this assumption is not applicable to the federal work force. One is the disproportionate number of federal holidays celebrated on Mondays. The other is the varying use at individual sites of work schedules that differ from the conventional 8 hours per day, 5 days per week.

To estimate the proportion of time from Monday through Friday to which the work force was actually exposed each day of the week, the following procedure was used. A centralized payroll service used by two-thirds of the facilities in the Department of the Navy provided the exact number of hours worked each day of the week by some 200,000 employees during a typical 2-week pay period without holidays. From these data, the proportion of all work hours occurring each day of the week from Monday through Friday was calculated, and applied in turn to a 40-hour workweek, thereby yielding an estimated average workday length of a typical Monday, Tuesday, etc.

Finally, federal leave calendars were obtained and the number of actual workdays in the study period counted, by day of the week. For each day of the week, the number of workdays was multiplied by the pre-

TABLE 1
Workforce Exposure by Day of the Week (Department of the Navy Civilians, 1989 to 1994)

Parameter	Monday	Tuesday		Wednesday	Thursday	Friday	Total
		Post-3-Day-Weekend	Regular				
Hours Worked During Typical Pay Period*	2,626,777		2,759,830	2,748,836	2,713,009	2,168,347	13,016,799
Average Workday Length (hours)†	8.07		8.48	8.45	8.34	6.66	
Workdays per Year‡							
1989	44	8	44	52	51	52	251
1990	45	7	44	52	51	51	250
1991	46	6	44	51	51	52	250
1992	47	6	47	50	50	52	252
1993	47	5	46	52	51	49	250
1994	46	6	46	52	51	50	251
6-year total	275	38	271	309	305	306	1504
Exposure Hours§	2219	322	2298	2611	2544	2038	12,032
% of total	18.44	2.68	19.10	21.70	21.14	16.94	100.00

* Data are sums for 183,975 employees during a 2-week nonholiday pay period in June 1994.
† Calculated as (hours worked each day of week in pay period ÷ total hours worked in pay period)(40 hours).
‡ Counts are for the 12 months ending June 30 of the year noted.
§ Calculated as (average workday length, in hours)(total workdays).

viously estimated average workday length to yield an hour total for the 6-year study period; from this total, the proportion of the total exposure time that occurred each day of the week was calculated.

Because injury occurrence and claims behavior on Tuesdays may depend on whether the preceding Monday is a workday or part of a 3-day weekend, we took the additional step of distinguishing for analyses the exposure and events occurring on the two types of Tuesdays.

Statistical Analyses

We used 2 × 2 contingency tables and chi-squared (χ^2) tests to assess the significance of differences among injury types in the proportions of Monday-occurring events. Graphs were used to evaluate trends in the changing proportions of various injury types over the course of the week and multiple logistic regression models were used to examine the relationship between demographic, occupational, and injury characteristics and the filing of a Monday vs a non-Monday sprain or strain claim. All analyses were conducted using the Statistical Analysis System (SAS) version 6.0.[6]

Results

Table 1 shows the percentage of exposure time that occurred each day during the 6-year study period. The greatest exposure occurred on Tuesdays (considering regular and post-3-day weekend Tuesdays together), and the least on Fridays. Mondays accounted for 18.44% of the total.

Table 2 shows the distribution by day and injury type of the 55,802 lost-time injuries that occurred during the 6-year study period on a nonholiday Monday through Friday and were accepted for benefit coverage by OWCP. These claims were filed by 43,315 different people, of whom 80% filed only one claim each. Almost half of the injuries were sprains and strains, and of these, 22.42% were said to be Monday-occurring. In contrast, 20.24% of contusions, 19.49% of fractures, 19.79% of lacerations, and 19.52% of all other injuries were said to be Monday-occurring. Each of these latter four proportions are significantly lower than the Monday-occurring proportion of sprains and strains ($P \leq .005$, using χ_1^2 for each comparison). These findings confirm the main results of Borba and Eisenberg-Haber.[1]

To test whether reported injury occurrence on Tuesdays after 3-day weekends differed from that of regular Tuesdays, we compared the proportions of injuries that were sprains and strains. Over the entire 6-year study period, 54.94% of all injuries occurring on a Tuesday after a 3-day weekend were sprains and strains, vs 47.97% of those that occurred on a regular Tuesday ($P < .001$, using χ_1^2). In all 6 years individually, the proportion of injuries that were sprains and strains was higher on post-3-day weekend Tuesdays than on regular Tuesdays.

Table 3 shows injury counts adjusted to remove the effect of the work force's differing exposure to each day of the workweek over the 6-year study period. These are the counts expected had a uniform 20% of the exposure occurred each day of the week. Because post-3-day week-

TABLE 2
Actual Counts and Percentages of Lost-Time Claims* by Nature of Injury and Day of Injury Occurrence (Department of the Navy Civilians, 1989 to 1994)

Nature of Injury	Monday	Tuesday		Wednesday	Thursday	Friday	Total
		Post-3-Day-Weekend	Regular				
Sprains and Strains							
n	6047	868	5227	5540	5130	4164	26,976
%	22.42	3.22	19.38	20.54	19.02	15.44	100.00
Contusions							
n	1754	201	1780	1898	1802	1233	8668
%	20.24†	2.32	20.54	21.90	20.79	14.22	100.00
Fractures							
n	560	84	530	639	591	469	2873
%	19.49†	2.92	18.45	22.24	20.57	16.32	100.00
Lacerations							
n	469	61	411	539	512	378	2370
%	19.79†	2.57	17.34	22.74	21.60	15.95	100.00
Others							
n	2912	366	2948	3253	3090	2346	14,915
%	19.52†	2.45	19.77	21.81	20.72	15.73	100.00
All Combined							
n	11,742	1580	10,896	11,869	11,125	8590	55,802
%	21.04	2.83	19.53	21.27	19.94	15.39	100.00

* Data are unadjusted counts of lost-time injury claims accepted by the Office of Workers' Compensation Programs as meeting the criteria for benefit coverage; events occurring on holidays are excluded.

† $P \leq .005$ for differences vis-á-vis sprains and strains in the proportion of Monday-occurring events, using χ_1^2 for each test.

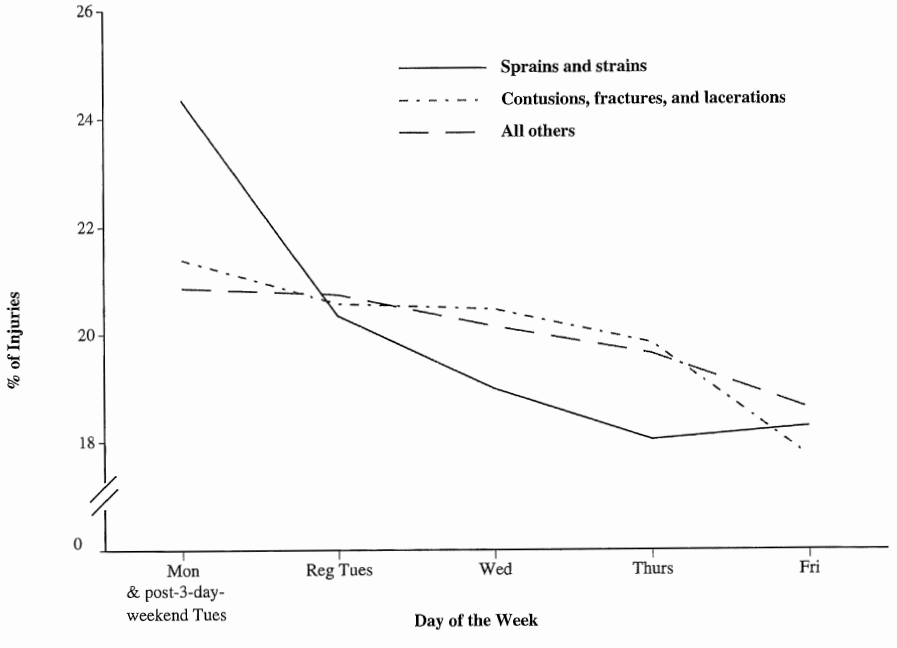

Figure 1. Distribution of lost-time injuries by day of the week and injury type (Department of the Navy civilian employees, Office of Workers' Compensation Programs' chargeback years 1989–1994). For each injury type, percentages plotted are the exposure-adjusted percentages of the workweek total that occur each day.

end Tuesdays behave more like Mondays than regular Tuesdays, we combined their data with the exposure and event data for Mondays. The results of the adjustment show that an even greater proportion of all sprains and strains are said to occur on the first day of the workweek than was indicated by the raw data. Again, the proportion of sprains and strains occurring on the first day of the week exceeded the corresponding proportion of each of the non-sprain-and-strain injury types ($P \leq .001$, using χ_1^2 for each comparison).

To evaluate the consistency of the elevated occurrence of Monday sprains and strains, we examined the proportion of Monday-occurring events by injury type within each of the 6 injury years, using exposure-adjusted counts and treating post-3-day weekend Tuesdays as Mondays. Because of their shared conceptualization as nonconcealable,[1] we combined contusions, fractures, and lacerations for this purpose. Figure 1 shows the percentage occurring each day of the week during the entire 6-year period for the resulting three injury categories. In each of the 6 injury years individually, the Monday-occurring proportion of sprains and strains was higher than the Mon-

TABLE 3
Exposure-Adjusted* Counts and Percentages of Lost-Time Claims by Nature of Injury and Day of Injury Occurrence (Department of the Navy Civilians, 1989 to 1994)

Nature of Injury	Mondays and Post-3-Day-Weekend Tuesdays	Regular Tuesdays	Wednesday	Thursday	Friday	Total
Sprains and Strains						
n	6549	5474	5106	4853	4917	26,899
%	24.35	20.35	18.98	18.04	18.28	100.00
Contusions						
n	1851	1864	1749	1705	1456	8625
%	21.46†	21.61	20.28	19.77	16.88	100.00
Fractures						
n	610	555	589	559	554	2867
%	21.28†	19.36	20.54	19.50	19.32	100.00
Lacerations						
n	502	430	497	484	446	2359
%	21.28†	18.23	21.07	20.52	18.91	100.00
Others						
n	3104	3087	2998	2923	2770	14,882
%	20.86†	20.74	20.15	19.64	18.61	100.00
All Combined						
n	12,616	11,410	10,939	10,524	10,143	55,632
%	22.68	20.51	19.66	18.92	18.23	100.00

* Data are counts of lost-time injury claims accepted by the Office of Workers' Compensation Programs as meeting the criteria for benefit coverage adjusted to reflect a uniform exposure across days of the week (or combinations thereof).

† $P \leq .001$ for differences vis-á-vis sprains and strains in the proportion of Monday-occurring events, using χ_1^2 for each test.

day-occurring proportion of contusions, fractures, and lacerations combined, and in every year but 1993, the difference was significant ($P \leq .05$, using χ_1^2 for each comparison). For comparisons vis-á-vis the "all others" category, the proportion of Monday-occurring sprains and strains was higher in all 6 injury years, and significantly so ($P \leq .05$) in every year but 1989.

Characteristics of Monday Sprain and Strain Claimants

Of the 26,976 lost-time claims for sprains and strains occurring during the study period (Table 2), we were able to match 98.7% to the claimants' personnel records. Unmatched claims did not differ significantly from the matched claims with respect to proportion of first-day-of the-week occurrences. The 26,633 matched claims were filed by 22,328 different employees, of whom 15% had filed more than one claim. Each claimant with multiple claims was represented in the subsequent analyses by a single claim chosen at random from among the claimant's multiple claims. Demographic, occupational, and injury characteristics of the 22,328 claimants are shown in Table 4, categorized by whether the claims were for injuries reported as occurring on Mondays (or post-3-day weekend Tuesdays) or later in the week. Univariate comparisons using *t* tests for continuous variables and χ^2 tests for categorical variables indicated several significant differences between the Monday claims and the non-Monday claims groups. We obtained virtually the same results when we used claims rather than claimants as the unit of analysis.

For the sample described in Table 4, all variables shown were entered into a logistic regression model. Final results of the model, selected using a backward elimination procedure, are shown in Table 5. Occupational class, body part, education, and supervisory status emerged as significant predictors of the filing of a claim for a lost-time sprain or strain said to occur on the first day of the workweek. Claimants filing claims for sprains and strains said to occur on Mondays were more likely to be supervisors, reporting an injury to their back or trunk, lacking a college degree, or craftsmen or mechanics. (The occupational classifications used by the Department of the Navy are assigned by the federal Office of Personnel Management; craftsmen and mechanics include such occupations as electrician, welder, and shipfitter.)

Discussion

With respect to the manner in which they reported lost-time injuries, the federal employees we examined appear remarkably similar to the private employees studied by Borba and Eisenberg-Haber.[1] These authors found an essentially constant rate across the workweek for injuries they classified as nonconcealable (ie, contusions, fractures, and lacerations), and an occurrence of sprains

TABLE 4
Characteristics of Lost-Time Sprain and Strain Claimants by Day of Injury Occurrence*

Characteristic	Mondays and Post-3-Day-Weekend Tuesdays	Regular Tuesdays Through Fridays
Claimants (*n*)	5677	16,651
Age at Time of Injury (mean years)	41.5	41.3
Gender (%)†		
Male	79.9	78.1
Female‡	20.1	21.9
Race (%)		
White	70.0	69.2
Nonwhite‡	30.0	30.8
Self-Reported Physical Handicap (%)		
With‡	13.6	12.9
Without	86.4	87.1
Education (%)†		
≤High school	67.6	67.2
Some college	27.1	26.2
≥College graduate‡	5.3	6.6
Occupational Grouping (%)†		
White collar‡	29.3	32.1
Blue-collar craftsmen and mechanics	54.0	50.1
Blue-collar operative and service workers	16.7	17.8
Health Plan Coverage (%)		
Known fee-for-service	31.0	31.8
Known prepaid or status unknown‡	69.0	68.2
Supervisory Status (%)†		
Supervisor‡	7.9	6.8
Nonsupervisor	92.1	93.2
Job Performance Rating (%)		
Superior‡	13.5	13.6
Excellent	49.5	48.8
Fully successful	24.7	24.4
Minimally acceptable	0.5	0.5
Unacceptable	0.2	0.2
Not rated	11.6	12.5
Annual Salary (%)†		
<$25,000‡	42.0	43.4
$25,000 to $39,999	53.8	51.8
≥$40,000	4.2	4.8
Body Part Injured (%)†		
Back or trunk	67.8	65.0
Other‡	32.2	35.0
Type of Employment Facility (%)†		
Industrial	53.5	51.9
Other‡	46.5	48.1
Reported Cause of Injury (%)		
Material handling	28.0	28.7
Slip or fall‡	41.7	40.0
Other/unknown	30.3	31.3

* Data are for claimants with claims accepted by the Office of Workers' Compensation Programs as meeting the criteria for benefit coverage, exclusive of events occurring on holidays, and for which matching personnel records were obtainable.

† Significant difference between groups at the $\alpha = .05$ level of significance.

‡ Referent category in logistic regression.

and strains that was significantly elevated on Mondays.

Figure 2 shows the day-by-day distributions of sprains and strains found by us and by Borba and Eisenberg-Haber. The similarity is obvious.

Equally similar but less immediately apparent is the magnitude in both studies of the Monday-occurring excess of sprains and strains. Borba and Eisenberg-Haber estimated that 18% of all lost-time sprains and strains reported as occurring on Monday were likely to have been the result of off-the-job weekend injuries.[1] Using the data in Tables 1 and 2, the relative risk that a sprain or strain will be reported by a

TABLE 5
Significant Predictors of Sprains and Strains Reportedly Occurring on Mondays (or Post-3-Day-Weekend Tuesdays) vs Later in the Workweek, From Multiple Logistic Regression Analysis

Variable	Adjusted Odds Ratio*	95% Confidence Interval
Education		
≤High school	1.18	1.03 to 1.36
Some college	1.23	1.07 to 1.42
≥College graduate	Reference	
Occupational Grouping		
White collar	Reference	
Blue-collar craftsmen and mechanics	1.16	1.08 to 1.25
Blue-collar operatives and service workers	1.01	.92 to 1.11
Supervisory Status		
Supervisor	Reference	
Nonsupervisor	.83	.74 to .93
Body Part Injured		
Back or trunk	1.12	1.05 to 1.20
Other	Reference	

* Estimated for each variable after controlling for all other variables in the table.

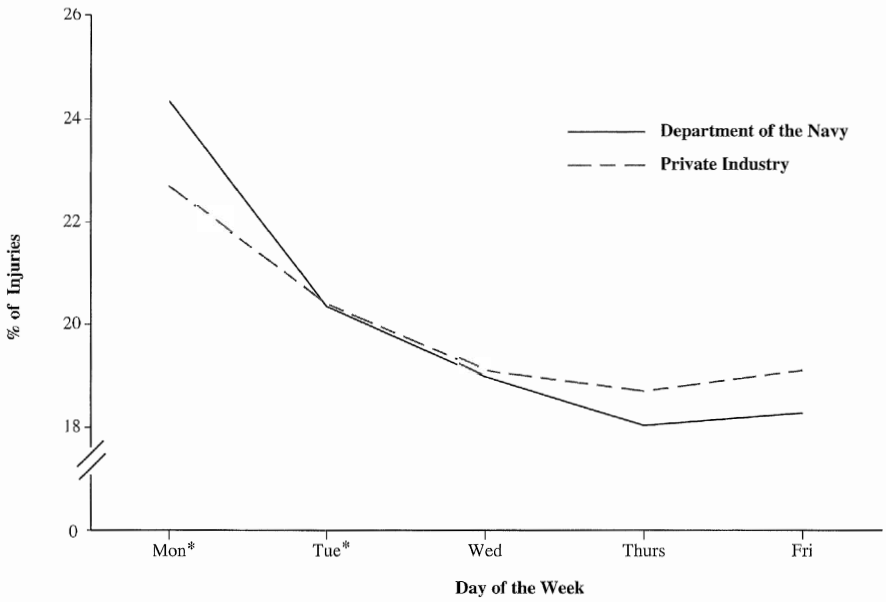

Figure 2. Distribution of lost-time sprains and strains by day of the week (Department of the Navy* civilian employees, 1989 to 1994, and private industry employees†, 1983 to 1986). *For the Department of the Navy, "Mondays" include post-3-day weekend Tuesdays, and "Tuesdays" are regular Tuesdays only. Data are exposure-adjusted percentages of the workweek total that occur each day. †Redrawn from Borba and Eisenberg-Haber (Reference 1); data from National Council on Compensation Insurance and used by permission.

Department of the Navy employee as occurring on the first day of the workweek rather than later is 1.29 (95% confidence interval, 1.25 to 1.32). Calculating the proportion of those Monday-occurring sprains and strains in excess of expected can be accomplished by subtracting the reciprocal of the relative risk from one; doing so indicates that in our population, 22% of the sprains and strains said to occur on the first day of the workweek are excessive.

Both our findings and those of Borba and Eisenberg-Haber indicate, not surprisingly, that the majority of all lost-time sprains and strains were to the lower back or trunk. Borba and Eisenberg-Haber additionally found, however, that on Mondays, the preponderance of lower back claims was even greater than at other times during the week.[1] We too found that the proportion of sprains and strains affecting the back and trunk was higher at the start of the week. In both our univariate (Table 4) and multiple regression (Table 5) analyses, there was a positive and significant association between sprains and strains to the back or trunk (as opposed to elsewhere on the body) and reported occurrence on the first day of the workweek.

The consistency of our findings and of those of Borba and Eisenberg-Haber, both across studies overall and across individual injury cohorts within each study, strongly suggests that the indicated variation throughout the workweek in the occurrence of sprains and strains reported to be occupationally related is a real phenomenon and is not simply the result of chance.

Several explanations for the excess of Monday sprains and strains are possible. One is that workers might be less attentive to risk and more prone to accidents after a weekend away from the job. However, if this were true, the occurrence of contusions, fractures, lacerations, and other injuries should be similarly elevated on Mondays, and this is not the case. Another possibility is that the reporting of seemingly minor injuries occurring at the end of the workweek is deferred until after the weekend. This explanation, however, is not consistent with what appears, if anything, to be an increase on Fridays in the occurrence of sprains and strains (Figure 2). A third possibility is that the risk of sprains and strains is truly and uniquely higher on Mondays, perhaps because of the contrast between sedentary weekend activity patterns and an abrupt transition to more physically demanding work regimens. However, age and sex were unrelated to the risk of a Monday occurrence despite their rec-

ognized association with occupational back injuries,[7] arguing against an important role for increased physical susceptibility.

The explanation advanced by Borba and Eisenberg-Haber, and the one that we are equally inclined to support in the absence of alternative compelling explanations, is that the rate of sprains and strains is elevated on Mondays because of injuries that were suffered on the weekend but were claimed by employees as work-related and as having occurred on the first day of the workweek.

Borba and Eisenberg-Haber estimated that the annual cost to private insurers for fraudulent sprains and strains alleged to have occurred on Mondays was between $175 million and $275 million.[1] We have previously estimated that the average cost to the Department of the Navy for a lost-time injury accepted for coverage by OWCP is $25,066.[3] A total of 6915 such sprains and strains were reported by Department of the Navy civilian employees as having occurred on the first day of the workweek from 1989 to 1994 (Table 2). If 22% of these claims were unwarranted, then claims unrelated to safety conditions at Navy facilities generated costs and future liabilities in excess of $38 million during this period. More broadly, the Department of the Navy is responsible for approximately one-seventh of the federal government's annual workers' compensation bill; if our findings are generalizable to the entire government, then federal costs for the type of possibly fraudulent claims we have examined exceeded one-quarter of a billion dollars during this period.

Persons filing claims for Monday-occurring sprains and strains are, in some respects, significantly different from claimants whose injuries occur later in the week. Compared with the latter, claimants for Monday-occurring sprains and strains are more likely to be supervisors, to report an injury to their back or trunk, not to be college graduates, or to be craftsmen or mechanics. If increased physical susceptibility or some explanation other than fraud is the cause of the increased occurrence of sprains and strains on the first day of the workweek, then these are the people toward whom prevention efforts should be directed. On the other hand, if the excess of sprains and strains on Mondays is the result of the filing of claims for injuries that in fact occurred off-the-job and on weekends, then claims adjusters can begin to use the criteria we have identified as the basis for a more stringent review of those claims that are possibly fraudulent.

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SUICIDE AND WEIGHT

British researchers have found that children who fail to gain enough weight as babies are more likely to commit suicide later in life. A check of child health records of 15,000 people born more than 60 years ago found that the 33 men and 10 women who killed themselves all had lower rates of weight gain in infancy. The findings, published in the *British Medical Journal,* showed no signs of child abuse.

From Schogol M. Personal Briefing. *Philadelphia Inquirer.* November 6, 1995, p D3.