Occupational injuries, workers' reporting and firms policies in the health care industry: the challenges and rewards of combining qualitative and quantitative research methodologies.

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ABSTRACT

Several studies have argued that official US statistics regarding occupational injuries are flawed because of systematic underreporting. This paper contributes to this debate by exploiting quantitative (administrative and survey data), qualitative (documents, interviews and focus groups) and job observation data. This richness of information permits us to better understand both the factors related to occupational injuries and the negative incentives (risks and obstacles) that potentially lead workers to underreport or not to file for workers' compensation. We study this topic in the context of the health care sector with data from four healthcare facilities in northwest Massachusetts.

Our data show substantial underreporting: in the facilities that we studied OSHA logs accounted for only one third of the corresponding workers' compensation records. Surveyed workers had reported only 38% of what they considered serious occupational injuries and only 45% of these injuries had been filed as a workers' compensation claim.

We found that poor awareness or knowledge of the reporting and workers' compensation systems do not explain underreporting. Instead, workers tend to underestimate the legitimacy of reporting accidents when injuries are not serious or are of the type they consider inevitable on their jobs. But even when reporting would be necessary, additional factors affect the costs of reporting: time pressure, concerns about reputation and career, and fear of the income losses and of the psychological distress (when workers define their identity through their profession) associated with time off work. Work environment characteristics such as time pressure, physical effort, and violence are also among the main determinants of the accidents.

1. Introduction

As of 2004, officially reported non fatal workplace injuries and illnesses occurred at a rate of 4.8 cases per 100 equivalent full-time workers in US private industries. These injuries and sicknesses were quite costly. Their costs included wage losses, productivity losses, medical expenses and administrative expenses. The National Safety Council estimated them to be over $156 billion dollars a year in 2003[1] but the public policy interest toward the problem seems to have diminished during the last few years, partly because administrative data have shown a continuous decline in occupational injury rates since the early 1990s (Figure 1).

Several studies, however, have argued that the official statistics regarding occupational injuries are flawed because of systematic underreporting. Labor economists have mainly been silent on this topic despite the implications that underreporting would have on some of their empirical research. First of all, underreporting would clearly imply much higher estimates of the national cost of occupational injuries and, potentially, renewed urgency to infuse the labor market with safety incentives. In addition, models of compensating wage differentials or of workers' compensation systems are tested on data of reported injuries. Underreporting could imply possibly large biases in empirical results, if, for example, some types of workers face systematic incentives to underreport, or if some of the factors that contribute to an injury (for example poor supervisor support) also deter workers from reporting. These problems would clearly affect those empirical economic analyses that study risk as a job attribute.

This paper contributes to this debate by exploiting the rare opportunity of studying this labor market phenomenon with information of very different nature: quantitative, qualitative and observation data. This richness of information permits us to better understand both the factors related to occupational injuries and the negative incentives (risks and obstacles) that potentially lead workers to underreport. We study this topic in

[1] The National Safety Council costs estimates have been lower than the ones presented in other studies (Leigh et al., 1997). Also, they do not include on-the-job assaults and murders.

the context of the health care sector, a very important and growing component of the American labor market[2].

Several reasons make the health industry an interesting case when studying the problems of underreporting. First the level of risk associated with the jobs in this sector is very high: in 2004, in terms of shares of total injury cases, the health sector and social assistance sector was second only after the manufacturing sector (16 percent versus 21 percent) (BLS, 2005). This sector is therefore likely to be responsible for a quite large share of the total costs of occupational injuries and illness in the US given that, already in 1993, the health services industries contributed 8.1 percent to the total cost of non fatal injuries resulting in work loss (Waehrer, Leigh, and Miller, 2005.) Second, given the predicted growth of employment in the health care sector, particularly in nursing and residential facilities, it is quite important to assess factors that may determine the retention rate of workers in this industry. And finally, because of their implications for employees' turnover, absenteeism, effort, and on employers' willingness to substitute capital for labor, it is quite likely that occupational injuries may affect negatively the main output of this industry, i.e. patients' safety and wellbeing.

Given that the available national statistics on occupational injuries are derived by individual firms' reports, it is essential to understand to what extent underreporting may be a problem and lead to an underestimation of the magnitude of these problems.

2. Evidence on reporting

In the US, records of occupational injuries and illnesses are collected through two different types of administrative records: the OSHA 200 logs and the workers' compensation data. Since the Occupational Safety and Health Act (1970) most firms with at least 10 employees are required to keep logs of all their work related injuries and illnesses with the exception of very minor injuries that only require first aid and not medical treatment, loss of consciousness, work restriction or transfer to other jobs. The Occupational Safety and Health Administration (OSHA) may review these forms during

[2] As of 2004 health care expenditures represented 16 percent of GDP. This share is predicted to grow to 20 percent by 2015 under the pressure of an increasingly aging population, advances in medical technology and increasing utilization (CMS, 2006).

possible worksite inspections and the Bureau of Labor Statistics samples these logs to produce an annual survey containing estimates of workplace injuries and illnesses.

While the OSHA logs represent information requested and collected by the federal government to monitor workers safety, the workers' compensation data describe very different state systems designed to compensate workers for the economic losses they may incur because of the medical expenses or earning losses caused by an on-the-job injury or illness. The workers' compensation system was developed as a no-fault system in the early 1900's with the goal of providing workers with protection in a legal system where they often were not able to challenge their employers and prove the employer's negligence. In return employees renounced their right to sue employers in court.

Several studies have discussed the shortcomings of each of these two systems as official sources of information about the magnitude of occupational injures and illnesses in the States (Azaroff et al. 2002). Leigh, Marcin, and Miller (2004) found that the annual U.S. Bureau of Labor Statistics estimates, based on firms' OSHA logs, miss between 33 percent and 69 percent of all injuries. They attribute this remarkable undercounting in part to the fact that the BLS statistics officially excludes several employment categories (individuals working on farms, government employees, self-employed individuals and private household workers), and in part to substantial firms underreporting of injuries. Selgman et al. (1996) had found that only 75 percent of firms that were required to keep OSHA logs did so and evidence suggests that often many of these are small establishments that may have more limited knowledge of law requirements and are more easily burdened by paperwork (Leigh, Marcin, and Miller 2004).

At the same time, research based on surveys of employees has described underreporting of occupational injuries and illness of more than 60 percent across different industrial sectors and jobs (Pransky et al., 1999; Scherzer et al., 2005). Workers often share common reasons for not reporting: fear of retribution by the employer, concern about supervisor's opinion, lack of knowledge of the reporting and compensating system, feeling that symptoms are not serious enough. In studies specific to the healthcare sector for example, Weddle (1996) found that 40 percent of hospital service workers had not reported one or more injuries and that most of them did so because they felt the injury was too minor, despite the fact that 64% of these unreported injures

required medical care and 44 % resulted in lost work time. Hospital service workers also were found to be less likely to report if older and with higher tenure (Weddle, 1996; Sarrri et al.1991) and doctors were much less likely to report incidents than midwives (Burke and Madan, 1997), which was somewhat surprising because we would expect less inhibition to reporting in those with more stable, secure and prestigious jobs.

As far as filing for workers' compensation benefits, it is clearly expected that only a fraction of workers with occupational injuries or illnesses will apply for compensation. In fact, only workers who sustain medical expense or whose spell out of work will exceed the "waiting period"[3] will qualify for benefits. Studies that have explored the frequency of filing for these benefits among eligible workers, however, still find rates of "under claiming" for eligible employees ranging from 30 to 75 percent depending on the health condition, suggesting that high percentages of eligible workers fail to use the workers' compensations system (Biddle et al., 1998; Rosenman et al., 2000; Shannon and Lowe, 2002; Biddle and Roberts, 2003; Morse et al., 2003). Severity of the injury[4], general health status, and unionization have all been found to be important determinants of claming behavior. After controlling for these factors, claiming behavior has also been found to vary widely across workplaces and industries, a result suggesting the need to better understand how individual firms' attitudes toward reporting affect workers' behavior. And last, but not least, economic analysis (Butler, 2004) has shown large effects of an increase in workers' compensation benefits and of a decline in waiting period on the frequency of insurance claims, and that this effect was much smaller when was measured on the frequency of OSHA logs data, suggesting claims reporting moral hazard[5]. It is important to notice that, as we discussed below, moral hazard behaviors in this context do not necessarily imply a wrong or inappropriate use of the reporting system. But despite the richness of information showing underreporting and under

[3] The length of the "waiting periods" (during which income benefits are not payable) varies by state and ranges between 3 and 7 days.

[4] For example, Alamgir et al. (2006) found much lower rates of underreporting (10-15%) among hospitalized workers.

[5] The analysis of Card and McCall (1996) about the timing of the filing of workers' compensation claims however leads to a rejection of the moral hazard hypothesis.

claming and, to the best of our knowledge, the lack of scientific studies about the magnitude of unethical workers' behaviors, public opinion often associates the notion of occupational injuries and of workers compensation with the one of "fraud" or of abuse. The goal of this study is to better understand what are the possible incentives leading to reporting and filing claims and to which extent different type of data and analysis can help us better understand these problems.

3. Theoretical Framework

Economic analysis has looked at the risk of different occupations and industries in the context of models of occupational choices where workers chose jobs that maximize their utilities defined as U= U(X, Z), where X and Z represent respectively individual and job characteristics. Following the theory of compensating wage differentials, the analysis has mainly focused on the relationship existing between two jobs characteristics, wages and occupational risk[6]. However, we know relatively little about workers' behaviors when accidents actually happen. They may decide to report their accidents to increase awareness of the risk associated to their job, and they may file for compensation benefits if the injury produced medical expenses or income losses. Indeed, workers have the right of reporting occupational accidents, and US regulations requires almost all large firms to report all non minor injuries and illnesses. Similarly, as far as filing compensation claims, the workers' compensation system is considered an entitlement program, a program in which all qualified individuals are served regardless of possible firms or states' budget constraint. The high rates of underreporting and under filing found in the existing literature and the litigious nature of the workers' compensation system, however, raise several doubts about the extent to which workers feel indeed entitled to act after an occupational accident. It is possible that employees may perceive the outcomes of reporting or filing as uncertain and potentially risky. Heckman (2004) suggested that

[6] Empirical research has generally supported the prediction of compensating wage differentials in the case of fatal injuries, but there is much more mixed evidence in the case of non fatal injuries (Viscusi, 1993). Lately the theory has also been further criticized because of the development of behavioral economics that has underlined how individuals may not perceive risk accurately because of systematic biases (Seabury et al., 2005).

especially in the case of no entitlement programs it is important to study the determinants of participation into social program by decomposing the process in five stages: eligibility, awareness, application, acceptance, and enrollment. He noted that this approach may permit us better to understand potential sources of inequality in the receipts of government programs and his study showed how this approach permitted assessment of the role played by personal choices, program features, and parties' conflicting interests.

Some workers may doubt that their injury or illness is *eligible* to be reported or to be compensated. This can happen for example when accidents results in health problems that are difficult to diagnose and do not result in immediate medical treatment (as in the case of back injuries or "emotional" injuries). But the perceived ineligibility could also result from the same assumption that originates the theory of compensating wage differential, that workers have knowledge of the risk associated to their occupations. If they perceive risk as an integral attribute of their job they may feel precluded from the right to report.

Employees may also lack *awareness* of their right to report and to be compensated for medical expenses and income losses. Employers may neglect to educate workers on these policies or the information may be provided at a time (for example during orientation) when workers still overestimate their ability to avoid risk and may therefore disregard the relevant information.

Workers, however, may experience the main conflicting incentives at the time of deciding whether actually to *report* the injury or to *apply* for workers compensation benefits. Workers may benefit from reporting if employers take action to reduce the risk associated to their jobs or if they think that an early report may increase the legitimacy of potential future claims. In terms of applying for workers' compensation, we have already mentioned that some economic studies have highlighted the existence of possible moral hazard given the empirical evidence that workers have higher propensity to file claims in correspondence of more generous insurance benefits and the perceived value of these benefits will increase with the level of uncertainty workers may attribute to their flow of future earnings (Kreider, 1998). At the same time, it is interesting to notice that often the literature on this topic seems to imply employees' tendency to exploit the system, but has been quite silent on the nature of the costs associated with reporting or filing a claim. If

such costs are related to job characteristics (such as career perspectives or the quality of relationship with coworkers) that are arguments of the worker's utility function, then the decision to report could produce utility losses.

Formally, we assume that a worker will decide how to act based on the following decision rule (where reporting is captured by report=1):

$$\text{Report} = \begin{cases} 1 & \text{if} \quad EU>0 \\ 0 & \text{if} \quad EU\leq 0 \end{cases}$$

where EU represent her expected utility:

$$EU = p * U^{RH} + (1-p)\, U^{RN} - U^{S}$$

Here p is the probability of receiving help (or seeing the implementation of new safety procedures), U^{RH} is the utility when the report leads to help, U^{RN} is the utility when reporting has no effect, and U^{S} is the utility when the workers decide to remain "silent"[7]. If the probability of receiving help is very low and if reporting is associated with very high costs, then the value of U^{S} may be such that reporting or filing for benefits stops being a utility maximizing behavior.

The opportunity costs of reporting could be quite high and diverse in nature. First, injured workers may risk a "reputation loss." Having been involved in an accident may be perceived as a "scar" that could jeopardize current or future jobs[8]. It could be interpreted by the employer as a signal of low productivity, of a confrontational character, or of financial need. Employees may be concerned that all this could also affect negatively their relationships with coworkers (who could resent the additional work load or negatively judge the ability and character of the injured worker) and with clients.

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[7] This decision process would describe also filing behavior where p would represent the probability of receiving benefits and U^{NB} the level of utility when the benefits are denied: $EU = p * U^{B} + (1-p)\, U^{NB} - U^{S}$. The recent paper by Card and McCall (2006) is an attempt to model a following step, i.e. the effect of different costs on workers' decision to contest the denial of a claim.

[8] In a more general context, Lewin and Peterson (1999) found evidence that employers exercise retribution (in terms of performance ratings, promotion rates, involuntary separations) against grievance flyers and their supervisors. The authors noticed, however, that their data could not permit to rule out completely the explanation that such outcomes were due to individual workers' performance.

Second, significant "transaction costs" may be associated both with learning about the rules governing reporting and filing and with actually acting on the decisions to do it. For example, the process may be difficult for workers who have limited literacy, who are unfamiliar with the human resources personnel, or simply, who are working under tight time constraint and feel they can not "afford" to interrupt their tasks.

Finally, filing a claim could complicate and limit the choice of medical care, and taking time off professional activities may affect workers' morale and produce income losses.

Workers may face significant challenges in making their decisions because of the uncertainty that characterizes most of these outcomes. Indeed, the comparison between costs and benefits may be complicated by the fact that reporting could have immediate consequences while the potential benefits will realize only the in the future ("temporal mismatch")[9]. Individuals may differ in their time preferences and in their higher or lower discounting of future utility. For example, workers who attach higher weight to current well being, may decide not to report an injury because of the fear of immediate retribution or inconvenience, discounting therefore the gravity of compromising their long term health and, consequently, long term employment. Similarly, while the cost associated with interrupting an important job assignment to report an accident is immediately understood, the benefits of avoiding future health complications may be too uncertain ("saliency mismatch"). Here is where more senior and experienced workers may have an advantage because of their better ability to understand the gravity of an accident. And finally, the fear of compromising a job may completely overshadow the benefits of avoiding future health risk or of being compensated for medical expenses and income losses ("scale mismatch"). This may particularly true for low income workers.

The fact that individual characteristics and preferences may largely explain individuals' ability to compare costs and benefits and therefore their propensities to report or to file for benefits does not dismiss or contradict, however, the prediction that

[9] Prelec (1991) introduces the concepts of temporal, saliency, and scale mismatches. For a further discussion see also Seabury et al. (2005).

firms policies and practices aimed at reducing reputation and transaction costs would greatly increase the willingness to report occupational accidents[10].

Firms indeed may face several incentives to discourage reporting by workers or recording of reported injuries (Leigh, Marcin, and Miller, 2004). Maintaining OSHA logs can be administratively burdensome, especially for smaller companies. Higher OSHA logs also increases the firm's probability of becoming a target for OSHA inspections[11]. Theoretically, they may also tarnish a firms' reputation affecting its ability to recruit and keep the best workers and, theoretically, increasing costs produced by compensating wage differentials. Clearly, the tighter the labor market, the more firms will be concerned about this type of consequences. In addition, high rates of injuries may be reflected in firms experience ratings and increase the cost of workers' compensation insurance, or simply increase the cost of workers' compensation claims for self-insured firms. The relationship with the insurance industry clearly affects firms' willingness to *accept* claims and *enroll* employees in the workers' compensation system.

Sometimes, managers may also not be aware of the incentives to underreport that they infuse into a work environment, as in the case of some safety programs that reward managers not on the basis of their implementation of new and safer production techniques, but on the basis of a decline in the number of reported occupational injuries or illness (Pransky et al., 1999). At the same time it is also true that different incentives could lead firms to facilitate the reporting process: firms may calculate that when workers believe themselves to be employed by a company with transparent and employee-friendly policies, they may show higher effort -and so higher productivity- and stronger attachment -and so lower firm adjustment costs[12].

Because of all the different and conflicting interests involved, the study of the reporting process is clearly complicated. It requires information about both the work environment and individual preferences that are unlikely to be included in administrative

[10] Currie (2205) develops this argument in the more context of the take up of social programs.

[11] Ruser and Smith (1988) found however, only an underreporting of 5-14% among high hazard plants potentially subjected to the OSHA records check procedures after 1981.

[12] Ichniowski (1986) shows that the presence of formal grievance procedures can be associated with higher firm productivity.

data. At the same time it requires analyses that can validate worker's survey data. Therefore, it represents a great opportunity to show how different type of data and data collection methodologies can help achieving a deeper understanding of labor market problems.

4. The data

The data analyzed in this study were collected for a study funded by the NIOSH (the National Institute of Occupational Safety and Health) under the name "PHASE in Healthcare." The study focused on the relationship between socio economic status, health disparities and work environment among health care workers. It had a very strong multidisciplinary nature because of the specific programmatic goals of the funding agency.

The project developed around the collection of a variety of quantitative and qualitative data from participating health care facilities and their employees: two acute-care, non-profit, community hospitals and two long-term care facilities in northeastern Massachusetts (one for profit and one non-profit). Two unions representing health care workers also participated in the study providing additional participants to focus groups. The process required developing specific protocols for data collection, storage and analysis for confidential records and official documentation. The resulting data were of different nature, ranging from administrative payroll records to focus groups transcripts. A detailed description of the project and of the data collection process is included in the Appendix. We present only the key issues here.

The Administrative Data: *Workforce rosters* and *OSHA logs* were requested from the participating health care facilities and the *workers' compensation data* were requested from the insurance companies of the facilities. Some facilities provided only some of the data and for different periods (ranging from 1997 to 2004).

When possible all this information was merged at the individual level (except for the OSHA logs that could be analyzed only at the level of job title). Department-specific job title, hourly wage information, written job description from facilities and some researchers' own knowledge of educational requirements and level of responsibility were

combined to produce a categorical variable, the "PHASE-socio economic position." Five categories were designed to capture not only salary and education but also supervising and decision making responsibility and labeled administrative, professional, semi-professional, skilled, and semi skilled workers (Scollin et al., 2005).

The Survey Data: Employees were surveyed in one hospital (Hospital 2) and in the two nursing homes. A three-step approach was used to collect survey data. Workers were first mailed an *Epidemiological Baseline Questionnaire (EBQ),* designed to collect mainly detailed information on current and recent health endpoints under study as well as indicators of socioeconomic position, and work environment characteristics. A total of 1,144 EBQ surveys were distributed in one hospital and 307 surveys were distributed in the two nursing homes. The overall the response rate was about 34 percent. Those who completed the survey and volunteered to be followed-up were asked to complete the *Outcomes Baseline Questionnaire (OBQ)* to gain additional information about their employment history as well as of potential health and economic consequences of health problems (including occupational injuries). The response rate for this second survey was much higher: 72% (n=236 out of 327 mailed surveys). Finally, 12 months after the first epidemiological survey was returned, all respondents were administered a third survey, the *Outcomes Follow-up Questionnaire (OFQ*), again by mail. This was designed to capture the longer term economic and health outcomes of the health problems that individuals had originally reported, accounting for new events that may have occurred in workers lives: changes in labor force participation, in employment status, new injuries, and new household characteristics. Again, the response rate for this last survey was high: 70% (n=237 out of 335 mailed surveys).

The Observation Data: The PHASE research team included ergonomists who entered the research field to observe workers on site during two working shifts. They used the PATH method (Buchholz, Paquet et al. 1996), a validated tool of estimating the percentage of observation time that employees are exposed to known postural and physical stressors within predefined time intervals (here 90-seconds observation cycles) . They also enriched their data collection by recording information on (a) degree of work routinization, a measure of repetition; (b) task variability (positioning), a measure of monotony; (c) degree of responsibility for safety of others, a measure of psychosocial

stress; and other measures of work organization and work load, such as frequency of overtime, absenteeism in the job title and others. These variables were recorded on a pre-designed cover sheet and were collected by means of informal conversations with managers, supervisors and individual employees and, in addition, by reviewing written job descriptions.

The Qualitative Data: Qualitative data used in the PHASE project included documents and records (10 years of written hospital and nursing home policies, newsletters, media reports and other documents), 54 interviews with health care managers[13], and focus groups with 197 health care workers.

Interviews focused on a range of topics including: financial issues, diversity and discrimination in the workplace, the organization of work, work-related injuries and programs to deal and prevent injuries, violence in the workplace, management attitudes and policies, characteristics of the organization, the regulatory environment, staffing issues, provider reorganization, labor-management relations, and health care system restructuring

Input from 197 employees was collected on similar topics using focus groups and similar formats (Table A1). A total of 81 hospital workers, 54 nursing home workers and 62 unionized health care workers employed at non-participating facilities participated in the qualitative data collection.

Obstacles in data collection: Despite an initial endorsement and commitment to participate in the PHASE study by nine local health care facilities, five withdrew at some point of the data collection. The reasons for *partners' withdrawal* varied (Siqueira et al., 2005). Some of the health care facilities that had originally committed to participate decided to leave the study after the project decided to include two health care worker unions that had expressed willingness to recruit unionized health care workers for focus groups. Despite the fact that this segment of the research was going to be conducted in completely different settings from the participating facilities (which are not unionized), it

[13] Interviewed persons' job titles included: CEO, Executive VP, Administrator, Board of Trustees Chair, Human Resources Director, Workers Compensation Administrator, Director of Employee Health, Director of Nursing, Assistant Director of Nursing, Staff Development Director, Security Chief, Infection Control Manager, Director of Patient Services, Cultural Committee Chair, Hospital Lawyer, Dialysis Nurse Manager, Laboratory Manager and Occupational Health Nurse.

is possible that they became concerned that study results and reports could be used for union organizing. Other managers, after reading the survey tools, may have feared that the study's focus on workplace health and safety would lead to workers' demands for improvements that they were not prepared to meet. Some managers expressed concerns that financial difficulties and staffing shortages prohibited their participation. Health care provider organizations also withdrew participation possibly due to concerns that study results might potentially threaten their funding or undermine their decision-making power about how health care was delivered. The withdrawal of researcher partners was unfortunate because it slowed down the research process, caused a lot of unplanned recruitment efforts and decreased the study population from the original plan.

Soon however, researchers became aware of an additional difficulty: initially, facility managers had agreed to participate in the study without seeking any endorsements from employees. However, data collection required actual recruitment of specific employees to participate voluntarily in written surveys, focus groups, and/or job observations. The researchers found that the commitment of the organization to the project did not actually mean that workers would participate in the study.

In fact, the main cause for the *low survey response rates* was employers' unwillingness to allow the workers to fill surveys during their work time[14]. This was a major deviation from the original research plan. Surveys had to be mailed to workers' home addresses, and health workers are known to experience substantial time pressure and difficulty juggling home and work responsibilities. Also, because the addresses had been provided by the employers it is possible that workers became suspicious of the independent research aim of the university researchers despite the formally guaranteed confidentiality (through the signed Informed Consent Forms)[15].

Finally, as far as the administrative data were concerned, researchers discovered a tremendous *variety in the quality of record keeping* across facilities: problems ranged from variables that were systematically missing in some data bases to facilities that still

[14] Gore et al. (2005) found an increasing relationship between responses and PHASE socio economic position and an increasing, although not linear relationship between responses and hourly wage.

[15] In particular, hospital workers may have been weary and wary of surveys they had been required to complete in management's cost-containment efforts in the past decade.

kept records only in paper and not in electronic format. Also, in case of a nursing home, the "parent' corporation refused to provide workers' claim information.

5. The results

From official statistics we know that in 2004 health care and social assistance[16] represented almost 11 percent of all employment and 8 percent of all establishments in the US. Employment in these sectors is predicted to grow by 30.3 percent between 2004 and 2014, against an average employment growth of 14.8 for all industry sectors (BLS, 2006). Aggregate data also show that over the last five years healthcare workers enjoyed only a slightly higher average hourly earnings than workers employed in US private industry (Figure 2). At the same time, despite the expected positive relationship between fatigue and injuries, official statistics show that healthcare workers keep experiencing a dramatic higher increase in the number of worked weekly hours (Figure 3) and declining, although much higher, injury rates (Figure 1)[17]. Indeed, in 2004, in terms of shares of total injury cases, the health sector and social assistance sector was second only after the manufacturing sector (16 percent versus 21 percent). Hospitals and nursing homes led the list of the fourteen industries having at least 100,00 injuries and illness, with incidence rates of 8.3 percent and 9.7 percent respectively (almost double the 4.8 percent incidence rate for all private industries) (BLS, 2005.)

With this background, we look at how our different types of data contribute to the understanding of the factors affecting reporting of occupational injuries and illness.

Who is getting injured?

Before proceeding with the analysis of potential underreporting we gather information about the characteristics of the injured workers in our data. Our analysis

[16] The health care and social assistance sector includes: hospitals, nursing homes and residential facilities, ambulatory health care services, and establishments providing only social services.

[17] Figure 2 and 3 are based on data from the Bureau of Labor Statistics' Current Employment Statistics survey and the information officially available does not permit to distinguish between the educational and the health services sector. They are therefore not immediately comparable to the picture presented in Figure 1 which refers only to the health services sector and used data from the Bureau of Labor Statistics' Survey of Occupational Injuries and Illnesses.

builds on previous results obtained by PHASE researchers (d'Errico et al., 2005) with OSHA and O*NET job-exposure data. This previous study had shown that the socio economic position gradient in risk of injury was greatly explained by psychological and ergonomic workplace exposures. When we look at the descriptive statistics of our survey data (Table 1, columns 1 and 2), we find that serious injuries occurred less often among females and minorities, more frequently among workers who had just started working for the hospital (tenure <1) and among the ones with longer tenure (more than 5 years); that registered nurses represented the largest category of workers reporting serious injuries; and finally, injuries were much more frequent among workers for whom the job at the hospital was the only occupation, who worked longer hours, overtime, and on evenings/nights shift or on rotating shift.

Most of these findings are consistent with previous literature and are confirmed by our multivariate analysis. Table 2 (columns 1 to 3) show different Logit model specifications as we first control only for individual characteristics and wage (to test indirectly the hypothesis of compensating wage differentials, a hypothesis that is rejected) (column 1), then control for hours of work (column 2), and finally include some measures of psychosocial and ergonomic work place characteristics (column 3). Findings confirm that injuries are less likely among female, minorities, skilled[18] and medium tenure employees (1 to 5 years of tenure on the job). However, our data permit us to gain additional rare insights about the role played by working conditions. In particular a very significant role is played by the employees' effort, measured not only in terms of hours but also as physical job demands ("physical exertion" and "physical isometric load"). A violent environment ("experiencing or witnessing assault, abuse and fear on the job") is also associated with much higher likelihood of experiencing injuries; and supervisors play a key role in decreasing such likelihood. The effect of gender, in particular, disappears when the job characteristics are added to the model. Finally, column 4 presents the same model specification to capture more explicitly the experience of nurses against all workers in the facilities and confirms all previous results but also reinforces what we had found in other literature and in our descriptive data, i.e. that in our survey

[18] For our analysis we create a specific socio economic position for registered nurses, because they represent a substantial proportion of the our surveyed workers (25%)

nurses were among those who declared to have experienced a larger number of serious injuries. This background highlights the importance of working conditions as determinants of accidents.

How much and what is reported?

We now turn to the administrative data provided by the facilities to gain insights about the magnitude of the problem of occupational injuries and at what would be captured by official statistics based on individual firms' report.

Tables 3 and 4 permit comparison of percentages of occupational injuries between the two hospitals we studied and the average incidence rates reported by the Bureau of Labor Statistics -for both Massachusetts and the entire US- on the bases of OSHA records. With a yearly average rate of almost 7.5 % across the two facilities, our OSHA data mirror closely the national incidence rates of 8.2 % and the Massachusetts incidence rate of 9% (for 2001). Table 4, however, shows also a surprising result: rates of workers' compensation first report of injuries are almost three times what we find with the OSHA logs. This finding is unexpected because we would anticipate that only a subset of the overall injuries recorded by OSHA would be filed as possible workers compensation claims. To further assess this finding we then turn again to our survey data from the first two baseline surveys we administered. We find that 13.7 % of hospital workers who responded had a severe occupational injury (Table 5, column 3, footnote a), a value quite close to the incidence rate of 14% that we calculated in the same hospital by using workers compensation data as a percentage of all employees (Table 4, column 4).

This first piece of evidence leads us to the hypothesis that OSHA logs considerably under represent the frequency of occupational injuries and illnesses, and therefore the riskiness, of the health sector. The result is confirmed by the fact that our surveyed employees answered to have reported only 38% of their serious occupational injuries (Table 1, column 3).

To gain insights about which injuries may lead to undercounting in the OSHA records we look at the distribution of injury characteristics between the two types of administrative records (Table 6). The different distribution of the type of accidents between workers' compensation and OSHA data seem to indicate that certain type of

accidents (for example assault) have difficulty in being considered legitimate causes of report under OSHA regulation. They may however still be important signal of the level of risk associated to certain jobs, but a risk that fails to be captured by official statistics. Or it could be that in health care we are dealing with a working population that is more aware of the long term consequences of injuries and exposures and is therefore more proactive in filing for compensation. To further assess this possible explanation we turn now again to our survey and observation data.

What predicts reporting?

Our survey data have shown the importance of working conditions as determinants of accidents. It is now interesting to test whether similar factors are associated with the likelihood of reporting.

In our survey data, underreporting was much more common among surveyed hospital workers (41%) than among workers in nursing homes (13%). Table 1 (columns 3 and 4) shows descriptive characteristics of the injuries that were reported or not. The unit of analysis here is the single injury and not the individual workers because fourteen surveyed workers (24% of all injured workers) had replied to have experienced more than one serious injury on the job. Females and registered nurse are less represented among the unreported than among the reported cases. Underreporting seems to be more common among married employees, among employees with children or employees who did not own a house. These are possible measures of the financial pressure that may increase the need to keep working (and so not report an accident) despite a health problem. Literacy problems (proficiency of the English language or low education) do not seem associated with more underreporting. Indeed, the most educated employees (with a college or higher degree) and the employees with longer tenure (more than 5 years) seem to be among the largest categories of employees not reporting. Different types of injuries also seem to be evenly distributed among reported and not reported cases despite the difficulty associated with proving a problem among the non evident (“subjective”) incidents. And finally, again, longer hours and working on rotating shift seem more frequent among the underreported cases.

Table 7 presents Logit estimates of the determinants of reporting a serious injury. Estimations are conducted with robust standard errors corrected for potential heteroskedasticity and correlation of the error terms across injuries pertaining to the same individual. Although these results have to be interpreted with caution because based on a very small number of observations (n=79), they do support some of the findings implied by the descriptive analysis. Once again, the model specification changes from column 1 to column 3. The specification of column 1 aims at capturing the opportunity cost of reporting (higher age may be associated with more reporting if workers become more conscious about long term health consequences as they age; home ownership, a second job, and higher tenure may capture different household financial needs and degree of job security), but the specification does not seem to capture the determinants of reporting. As we start controlling for hours and amount of time pressure (table 7, column 2) we find, however, that these work environment characteristics are strong predictors of underreporting. And the supervisor's role (a measure that captures both individual support but also the supervisor ability for "getting the job done") seem to be playing a very important role in addition to the time pressure workers may be working under (column 3). Finally, older workers seem to be more willing to report but workers with the longest tenure are the ones that shy away from the process (possibly because of a better understanding of the full opportunity costs and benefits associated with reporting). Again, the effect of gender disappears as we control for job characteristics.

These estimations based on survey data show an environment where long hours and time pressure are very important determinants of the outcomes we are studying[19]. To better assess the value of this information, we turn then to different type of data, the ones collected by researchers who did site visits to observe employees' movements and level of activity during the day. Table 8 presents some of these observations and presents a clear picture where the majority of observed individuals, only 68% take formal breaks, understaffing and working under deadlines happen in more than 20% of the observed cases, and high time pressure is reported by almost 30 % of all observed individuals.

[19] Previous research in health care has underlined the relationship between understaffing and injury rates (Trinkoff et al., 2005) as well as the effect that mergers in the health industry have had on nurses' increased effort, but stable wages (Currie, Farsi, and MacLeod, 2003).

Our first conclusion is then that administrative data suggest a first cause of underreporting: firms and workers may consider some accidents not eligible to be reported. At the same time, survey and observation data suggest workplaces where both the occurrence of an injury and its reporting are more affected by working conditions than by difficulty in understanding the process or the financial risk associated with it. But these are conclusions that we, as researcher, can draw based on our inferences about the possible relationship between workers or job attributes and workers' beliefs, and behaviors. To validate these findings, and further understand workers' concerns about reporting, we now turn at the additional information employees provided in the surveys and during oral testimonies.

Workers' knowledge and experience with reporting and filing

Surveyed workers were asked specifically about their knowledge with injury reporting procedures and with the workers' compensation system. Workers discussed these topics also during focus groups and interview. Tables 9 and 10 summarize workers' answers using both the quantitative and qualitative information. They contain selected quotes that summarize thoughts expressed by several workers. The two different sources of data provide very consistent findings.

Our first result rejects the hypothesis that workers are *not aware and lack information* about their rights after an accidents: the large majority of surveyed workers knew about the existence of reporting polices, and was familiar with the workers compensation system, although a smaller percentage felt that the workplace was actually encouraging reporting. Underreporting was widespread: only 45% of workers with health problems thought that incidents were usually reported and only 8% had filed for workers' compensation (table 9). Similarly, only 45 percent of workers who had experienced injuries on the job had filed for workers' compensation (table 10).

One the biggest obstacle to reporting and filing claims is tied to employees' perception of which accidents are *eligible* to be reported. One hospital administrator claimed that his facility was encouraging all type of reporting, regardless of the degree of injury severity. But the first reason for not reporting a health problem or for filing a claim after an injury was workers' belief that the injury "was not serious enough." Second came

the widespread belief that "injuries are just part of their job.[20]" This last theme resonated very clearly in the conversation with workers[21] where the high level of risk associated with the job seems to be perceived almost with pride (tables 9 and 10).

We also learned more clearly what are the benefits and costs that may determine the decision to actually report or file a claim. Surveyed workers told us that they mainly reporting to their supervisor (77 % of cases). And although in many cases (46%) attention was given after reporting, in several instances there were no benefits associated with reporting: the reaction was simply to advise to be more careful in the future (10%) or no action was taken at all (34 %.). Focus group participants supported these findings giving example both of strong supervisors' support and of responses resulting in "victim blaming" (Table 9).

Focus groups permitted also a better evaluation of the costs associated with reporting. They clearly reinforced our econometric findings that *time pressure* is one of the main obstacles to reporting. They describe the bureaucracy of the reporting and filing process, and the fact that because it is very time demanding, it may just not be feasible in an environment characterized by understaffing. Indeed our review of facilities documentation validates workers' perceptions that reporting can be a laborious and time consuming activity (table 9).

Employees are also very concern about the consequences that reporting or filing claims could have on their *reputation*. On one side coworkers resent when they are asked to work harder and faster to cover a colleague who has either taken time off or has been assigned to light duty. On the other side almost one third of our surveyed employees was concerned that applying for workers' compensation could lead to discrimination, missed promotions, or job losses (table 10).

Workers described also their resistance to apply for workers' compensation benefits because of the inadequacy of income replacement and the fear of losing fringe benefits,

[20] For a further discussion on this topic see O'Sullivan et. al (2005).

[21] The discussion in focus groups on return to work was prompted with the following starting questions: "When someone gets hurt at work they may tell their supervisors, employees' health service, union representative, co-worker, or no at all. In your experience, which of these would be more likely? Why?" and "Do people in your workplace usually file for workers' compensation after getting injured at work? Why or why not?"

such as health insurance, for the entire family. The ones who had filed for workers' compensation discussed the difficulties of navigating this system and the very negative experience they had with medical care (table 10).

One of the more interesting findings, however, was about the costs that time off has on workers in terms of their very own *perception of themselves*. A discussion about the nature of nursing prompted general agreement among all focus group participants:

"[after the problem] I continued to work....I didn't' want to lose my identify as a nurse...The identity of what you do and who you are is very, very tied up into nursing....They need me at two in the morning. That's how important I am, type of thing. So, it is, you know, sort of a big push to continue to work" (nurse).

When we conduct econometric analysis to explore the determinants of individuals' decisions, we often run into the findings that not measurable personal choices, individual effects determine our results. This example shows how the possibility of hearing the "voices" of individuals may increase our insights about outcomes in a specific labor market[22].

Finally, we discussed how individuals' decisions may be affected by the ability to assess costs and benefit because these may occur at different time, they may be more or less easy to understand and imagine, and they can be quite different in scale. The analysis of focus groups highlights some individual attributes potentially related to the different weights attached by workers to benefits and costs.

We found for example evidence of the importance of being able to calculate future costs: in our statistical analysis we had found that older workers were more likely to report but that longer tenure workers were less likely to do so. The qualitative data told us that younger nurses report less frequently because they don't have the health and safety understanding that more experienced nurses have. We were also told that in hospitals, although nurse and doctors may be more prone to report because more able to recognize the gravity of symptoms, they may be the ones who report less because they are likely to have better heath care policies and disability policies.

[22] Similarly, Heyes' study (2005) shows how the status of nursing as a 'vocation' contributes to the compression of nurses' wages.

However, we also heard that some young workers are more likely to report injuries than their older counterparts because their generation has a culture of not putting up with unpleasant experiences. This is an example of how the vivid recollection of an event may lead to a decision that dismisses more uncertain and unclear consequences. And finally, for some workers the immediate cost of reporting may by far overshadow any potential future benefits: conversations suggested fear of reporting among immigrants workers who are concerned about losing their working permit.

The managers' views

It is interesting that when managers were interviewed they confirmed the presence of reporting polices but, when talking underreporting they gave very similar explanation to the ones provided by workers, i.e. injuries as part of the job, time constraints, and the key role of supervisors. They also stressed the importance of developing a safe work environment although, interestingly enough, 59% of workers had declared to have attended only an average of three hours of health and safety training during the previous years (table 9).

One of the most interesting findings, however, was the discussion about the workers' compensation system. It highlighted factors that affect the likelihood of being *accepted* and *enrolled* in the system.

Despite the fact that the majority of our "sick" surveyed workers (92% in Table 10) and of our injured workers (55% from Table 10) had not filed for workers' compensation, some conversations with managers focused on examples of fraud by some claimants and their "dishonest" attitudes:

"...there are people who just aren't going to report something because, you know, it's a chronic condition. And those people are stoic throughout their life and they are not the kind of people that are going to become a burden on the facility or a burden on the workman's compensation system, but there are also people who will, you know what I mean, scratch their finger on the Scotch tape holder and fill it and send in a report"(Nursing home administrator).

The belief of moral hazard behaviors can be so pervasive that managers added the need to be careful reviewers of workers' compensation claims to avoid the hiring of those individuals:

"....who are looking to use the system....and know where they can do that. They know that certain companies don't have those things [drug testing, pre-employment physical, etc.] in place and they will try to go there to have their alleged work related injury" (Nursing home administrator).

Interviews, however, showed how firms' behaviors and attitudes toward injuries are also the result of wider market forces:

"[Facilities] are much more focused on getting their hands wrapped around workers comp, controlling costs" [and this is because] "insurance carriers are being much more choosy, they are in the driver's seat. They can pick and chose their customers because they are so few carriers available now. Several companies have closed. Several large companies remain, and they are being much more picky about who they are taking on as a risk.....The customers have to abide by their rule and regulations" (Nursing home administrator)

Facilities feel pressure to control injury costs because of the increasing market power of insurance companies

Conclusions

In this study we analyze the problem of underreporting of occupational injuries and illnesses in the health sector, one sector that is continually growing in size and importance in the US economy. To study underreporting is important: if official statistics underestimate the number of injuries and illnesses, we may need to further advocate public policies addressing job safety. We may also be concerned about our ability to properly test those economic theories that examine the role of occupational risk in the labor market.

Our data show substantial underreporting: in the facilities that we studied OSHA logs accounted for only one third of the corresponding workers' compensation records. Surveyed workers had reported only 38% of what they considered serious occupational injuries and only 45% of these injuries had been filed as a workers' compensation claim.

We found that poor awareness or knowledge of the reporting and workers' compensation systems do not explain underreporting. Instead, workers tend to underestimate the legitimacy of reporting accidents when injuries are not serious or are of the type they consider inevitable on their jobs. But even when reporting would be necessary, additional factors affect the costs of reporting: time pressure, concerns about reputation and career, and fear of the income losses and of the psychological distress (when workers define their identity through their profession) associated with time off work. Work environment characteristics such as time pressure, physical effort, and violence are also among the main determinants of the accidents.

Managers are aware of underreporting and perceive the potential long term advantages of using reporting as a tool for developing safe environment. However, despite the rich evidence of a tremendous amount of employees' "self-constraint" in reporting or applying for workers' compensation, managers show a subtle belief of workers' moral hazard behaviors. In addition, they see injuries as an inevitable feature of their industry, a feature that leaves them only with the incentive to monitor claims and control their costs.

The generality of our findings is clearly limited. First, we have studied a very unique sector, an industry characterized by a very tight labor market where time pressure is a known problem. In addition, these workers are likely to be quite knowledgeable about the consequences of health problems. They may be also particularly motivated on their job. Second, because of the difficulties encountered in collecting data from our facilities, our results are based on a very small number of observations. Clearly our findings need to be tested with further research.

At the same time, our study is a rare example of how data of different nature (administrative, survey, observation, and qualitative data) can lead to a deeper understanding of a problem. Each data source offers significant advantages. Administrative data permit us to assess the magnitude of a phenomenon and its relevance in the context of the broader economy and regional or national labor markets. The richness of survey data offers the great advantage of exploring the relative importance of a variety of factors in determining specific outcomes. Observation data can add great insights about work environment and objectivity to survey responses. Qualitative data may confirm our conclusions but also add incredibly useful insights about additional industry specific key variables, and about new hypotheses and research questions.

Such variety of data permits a very rich analysis but it comes at very high costs: this data collection is very time consuming; because of its multidisciplinary nature it requires researchers to learn about other disciplines, other methodologies, and research protocols; because of its extensiveness it asks for tremendous collaboration by the observed facilities. Collaboration and access to workers can be hard to obtain, however, especially in industries that try to control costs by increasing employees' effort.

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Figure 1. US Private Industry: rate of injury & illness per 100 full-time workers (total recordable cases) **(**Source: http://data.bls.gov/)

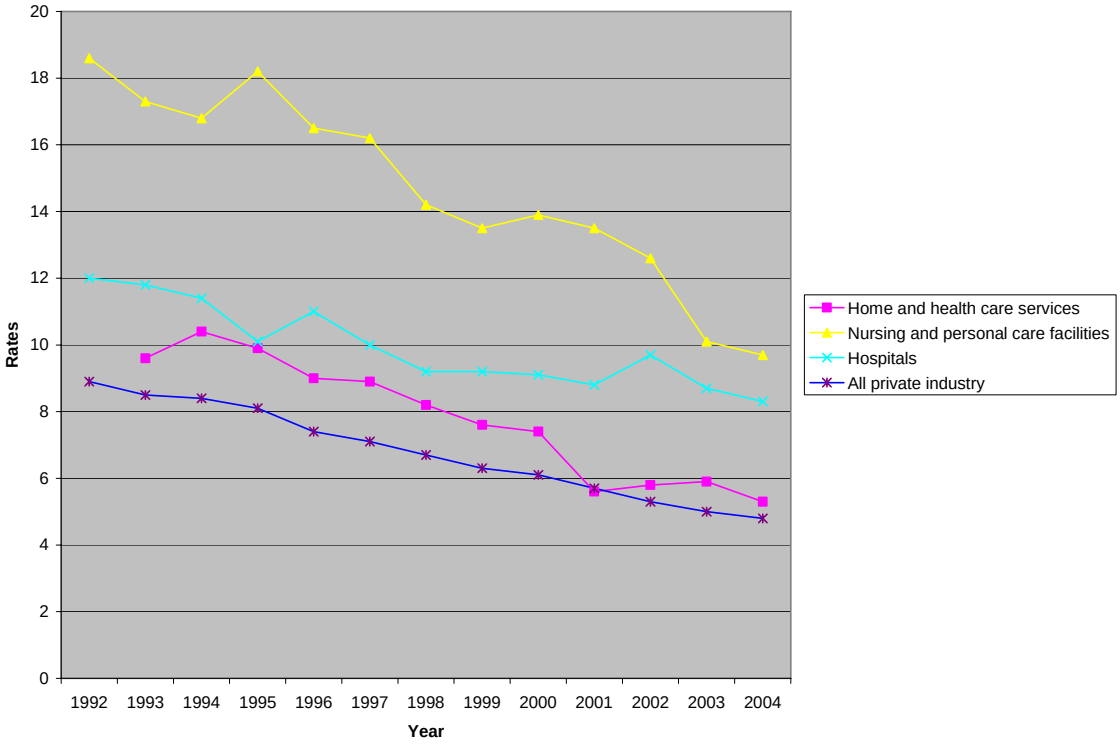

Figure 2: US Private Industry: Average Hourly Earnings
(Source: http://data.bls.gov/)

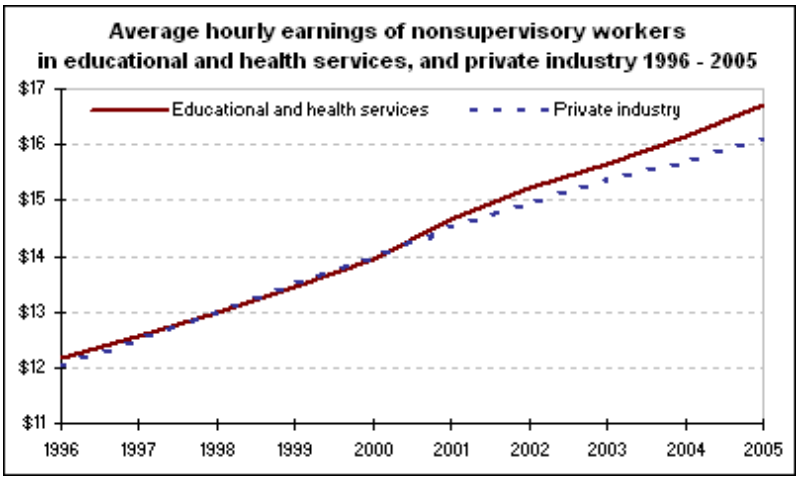

Figure 3: US Private Industry: Index of aggregate weekly hours (2002=100)
(Source: http://data.bls.gov/)

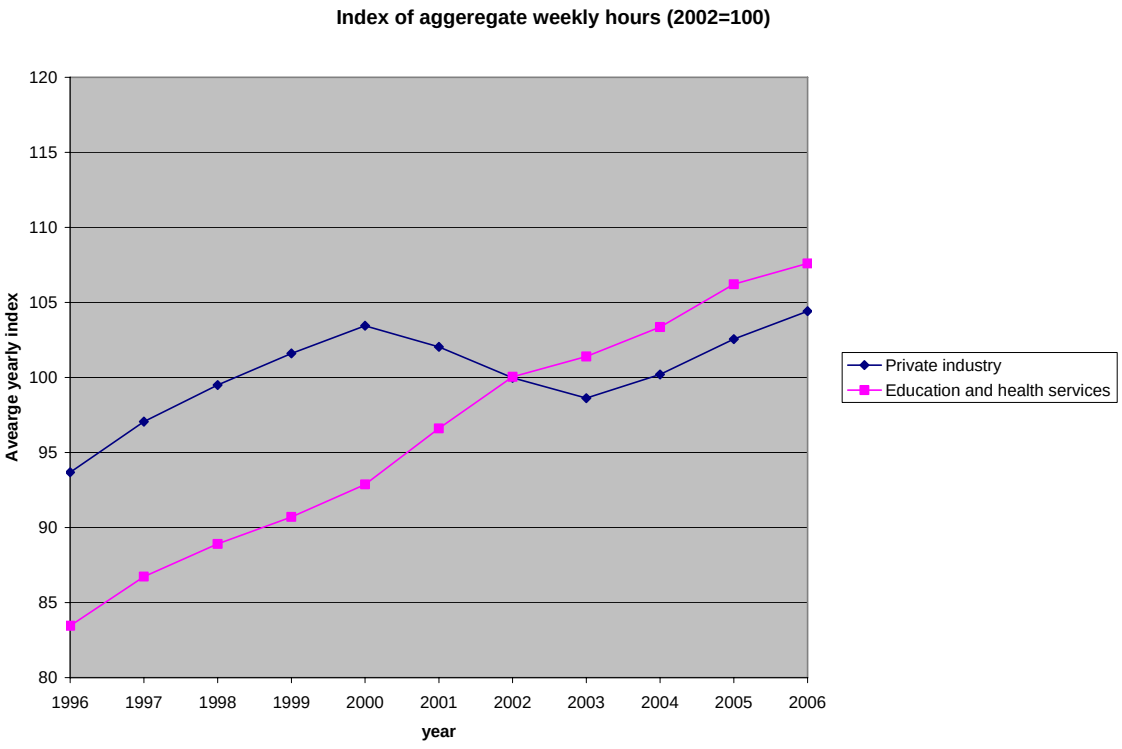

Table 1: Survey data: summary statistics (weighted mean and standard deviations)

	WORKERS WITH				**SERIOUS INJURIES WERE**			
	(1) no serious injury (N=421)		**(2) serious injury (**N=59)*		**(3) reported** (N=30)*		**(4) not reported** (N=49)*	
	Mean	**S.D.**	**Mean**	**S.D**	**Mean**	**S.D.**	**Mean**	**SD**
Female	0.85	.02	0.79	.05	0.83	.05	0.74	.11
Age	45.33	.05	45.33	1.4	43.67	1.5	42.73	2.5
White and not Hispanic	0.88	.01	0.96	.02	0.95	0.3	1.00	.00
English main language	0.88	.01	0.91	.04	0.90	0.5	1.00	0.0
Married	0.66	.02	0.62	.07	0.60	.09	0.68	.11
With children	0.48	.02	0.44	.06	0.45	.09	0.66	.11
Home owner	0.78	.02	0.84	.04	0.80	.09	0.74	.11
Other working adult	0.87	.02	0.86	.05	0.87	.06	0.95	.04
Less than HS	0.03	.01	0.02	.02	0.03	.02	0.00	.00
High school	0.12	.01	0.10	.03	0.06	.03	0.23	.10
Less than college	0.50	.02	0.48	.07	0.50	.09	0.37	.12
College or higher degree	0.34	.02	0.39	.07	0.09	.09	0.40	.13
Hospital	0.80	.01	0.81	.04	0.78	.06	0.94	.04
Hourly wage	22.38	.55	23.66	1.1	23.63	1.4	23.68	1.8
Tenure<1year	0.16	.01	0.19	.05	0.26	.09	0.05	.05
1<=Tenure<5yrs.	0.43	.02	0.30	.06	0.35	.08	0.20	.09
Tenure>=5yrs.	0.40	.02	0.50	.07	0.38	.08	0.74	.10
Semiskilled	0.06	.01	0.07	.03	0.06	.03	0.08	.06
Skilled	0.29	.02	0.14	.04	0.15	.05	0.11	.07
Semiprofessional	0.22	.02	0.21	.05	0.16	.05	0.37	.13
Professional	0.16	.03	0.10	.03	0.10	.04	0.06	.05
Registered nurses	0.23	.02	0.44	.07	0.48	.09	0.31	.12
Administrative	0.04	.01	0.04	.02	0.03	.02	0.06	.06
Hold second job	0.29	.02	0.19	.05	0.23	.09	0.28	.13
Hours	32.5	.72	34.8	1.4	33.4	1.7	40	.95
Overtime	0.16	.02	0.25	.06	0.32	.10	0.28	.12
Fixed day shifts	0.71	.02	0.60	.07	0.56	0.1	0.63	.13
Fixed evenings or night shift	0.17	.02	0.22	.06	0.28	0.1	0.11	.07

Rotating shifts	0.12	.02	0.18	.06	0.15	0.0	0.25	.13
"Good health"[a]	0.96	.01	0.93	.03	0.92	.04	0.97	.03
"Objective" injury [a]			0.31	.06	0.30	.07	0.25	.11
"Subjective" injury			0.40	.07	0.43	.08	0.48	.12
"Other" injury			0.28	.06	0.26	.07	0.25	.12
Health Insurance	0.96	.01	0.96	.02	0.95	.03	1.00	.00

NOTES:

* The total number of workers with serious injuries differs from the total number of injuries for which we know the reporting status (49+30=79) because 14 surveyed workers had experienced more than one serious injury on the job.

a "Good health" describes workers who replied to be in "good, very good or excellent health." We define "objective injuries" as abrasions, bruises, cuts, burns, dislocation, fractures, and bites; "subjective injuries" as epicondylitis, strain, sprain, disc herniation; "other injuries" as multiple injuries and injuries for which we had no description.

Table 2: Survey data: Logit estimates of the determinants of having a serious injury at work (Hospital 2 and Nursing Homes 1 and 2, n=480)

	(1)	(2)	(3)	(4)
Female	-1.04 (.38)*	-1.12 (.40)*	-.18 (.48)	-1.05 (.44)*
Age	.10 (.09)	.09 (.10)	.12 (.12)	.09 (.11)
Age^2	-.01 (.01)	-.01 (.01)	-.01 (.01)	-.01(.01)
White and not Hispanic	1.60 (.64)*	1.70(.66)*	2.34(.83)*	2.05 (.80)*
Hourly wage	-.06 (.03)	-.05 (.03)	-.05 (.04)	-.01 (.02)
Semiskilled	Reference category			
Skilled	-.82 (.70)	-.92 (.74)	-1.73 (.86)*	
Semiprofessional	.02 (.73)	1.19 (.75)	-.96 (.88)	
Professional	-.37 (.89)	-.39 (.91)	-1.44 (1.17)	
Registered nurses	1.59 (.99)	1.41(1.0)	.63 (1.15)	1.13 (.46)*
Administrative	1.33 (1.33)	1.28 (1.3)	2.58 (1.64)	
Tenure<1year	Reference category			
1<=Tenure<5yrs.	-.75 (.44)	-.95 (.45)*	-1.32 (.49)*	-1.02 (.48)*
Tenure>=5yrs.	.10 (.45)	.05 (.44)	-.42 (.48)	-.24 (.46)
Less than HS	Reference category			
Less than college				-.25 (.61)
College or higher degree				.06 (.74)
Hospital	-.60 (.38)	-.54 (.41)	-.67 (.46)	-.59 (.45)
Hours		.12 (.06)*	.12 (.06)**	.11 (.06)**
Hours ^{2}		-.01 (.00)*	-.01(.00)*	-.01 (.01)**
Physical Exertion[a]			.30 (.08)*	.27 (.08)*
Physical Isometric load[a]			.10 (.13)	.06 (.12)
Supervisor support[a]			-.16 (.08)*	-.17 (.07)*
Violence at work[b]			.59 (.25)*	.43 (.23)**
Constant	-2.12 (1.98)	-3.48 (2.18)	-5.02 (2.92)	-5.46 (2.97)**

NOTE: * .025 significance level; ** .10 significance level. Standard errors are in parenthesis.

[a] These variables are core scales extracted from the Karasek-Theorell Job Content Questionnaire (JCQ) (Karasek, 1985 and Karaseket al., 1998). Physical Exertion summarizes questions assessing the amount of physical effort required on the job; Physical Isometric Load captures the frequency of working in physically awkward positions; Supervisor support measures supervisors' efficiency and attitudes toward individual workers and team work.

[b] This variable is a scale capturing the experience and witnessing of assault, abuse and fear on the job (Rogers and Kelloway, 1997)

Table 3: National statistics: Incidence rates of non fatal occupational injuries and illnesses (per 100 full-time workers) for the health services sector: 2001

Hospitals		Nursing and personal care facilities		Home health care services	
U.S.	**Massachusetts**	**US**	**Massachusetts**	**US**	**Massachusetts**
8.8	9.0	12.6	14.8	5.6	7.0

Source: Bureau of labor statistics, U.S. Department of Labor, Survey of Occupational injuries and Illnesses, in cooperation with State agencies.

Table 4: Administrative data: Percentages of reported occupational injuries and illnesses for two Massachusetts hospital: average yearly rates over the period 1999-2002

	Hospital 1 ∗ (fte=1226 and n=1,720)		**Hospital 2**∗∗ (fte=990 and n=1,354)	
	(1) OSHA logs (obs=318)	**(2) Workers' compensation first report of injury** (obs=822)	**(1) OSHA Logs** (obs=233)	**(2) Workers' compensation first report of injury** (obs=716)
Percent of full- time employees (fte)	9%	24%	6%	19%
Percent of employees on payroll (n)	6%	17%	4.6%	14%

∗ records averaged over the period 1/99-9/01

∗∗ records averaged over the period 1/99-9/02

Table 5: Survey data: percentages of severe occupational injuries and reported injuries

	Number (1)	**Percentage (2)**	**Weighted percentage (3)**
Total number of respondents	480	100%	100%
At least one serious injury at work*	59	12.3%	13.5%[a]
Total number of injuries at work	79	100%	100%
Reported injuries	49	62%	63% [b]

* Fourteen individual (24% of 59) replied to have experienced more than one work related injury for a total of 79 injuries

[a] This percentage was 13.7% for Hospital 2 and 12.5% for the two combined nursing homes

[b] This percentage was 59% for Hospital 2 and 87% for the two nursing homes

Table 6: Administrative data: Selected injury characteristics in two Massachusetts hospitals over the period 1999-2002

	Percent of workers' compensation first report of injury (n=1538)	**Percent of OSHA logs** (n=551)
Body parts:		
Hand/wrist	29.9	14.0
Arm/shoulder/neck	8.1	7.4
Back	11.6	13.6
Hip/lower extremities	11.6	7.8
Other	38.9	57.1
Type of incident:		
Struck by/against	32.3	39.5
Overexertion	18.6	18.8
Slip, trip, fall	15.6	2.9
Exposure /contamination	15.2	9.8
Assault	7.3	1.2
Other	10.8	27.5

Table 7: Survey data: Logit estimates of the determinants of reporting a serious injury at work (n=79)

	(1)	(2)	(3)
Female	-.20 (.73)	-.87 (1.0)	1.33 (1.01)
Age	.12 (.24)	.52 (.25)*	1.18 (.64)**
Age^2	-0.01 (.01)	-.01 (.00)**	-.01 (.01)**
Home owner	.36 (.80)	-.83 (.97)	-.43 (1.6)
Second job	-.37 (.80)	-.84 (.93)	-2.03 (1.39)
Semiskilled	Reference category		
Skilled	-.61 (1.22)	4.21 (2.78)	6.36 (4.8)
Semiprofessional	-.56 (1.09)	.86 (1.7)	1.08 (2.16)
Professional	1.12 (1.34)	1.12 (3.3)	2.48 (2.99)
Registered nurses	.38 (.99)	3.50 (2.34)	4.16 (2.52)
Administrative	-2.45 (1.85)	-4.33 (3.28)	1.28 (2.13)
Tenure<1year	Reference category		
1<=Tenure<5yrs.	-.50 (1.57)	2.60 (2.80)	1.28 (2.13)
Tenure>=5yrs.	-2.58 (1.05)*	-1.84 (1.7)	-3.65 (1.8)*
Hospital	-2.26 (1.39)	-2.3 (1.8)	-2.01 (1.41)
Objective injury	.38 (.69)	.24 (.88)	.42 (1.10)
Hours		-1.87 (.91)*	-1.73 (.67)*
Hours ^{2}		.02 (.01)*	.02 (.00)*
Time pressure[a]		-3.35(1.6)*	-4.72 (3.04)
Supervisor support			-3.88 (2.18)**
Constant	.14 (5.42)	25.93 (18.86)	14.09 (9.90)

NOTE: * .025 significance level; ** .10 significance level. Standard errors are in parenthesis and estimating with the Huber/White estimator of variance.

[a] Workers replied that they had "not enough time to get their job done."

Table 8: Observation data from site visits: percentages of observed workers

	Hospital 1 and hospital 2 (n=179)	**Nursing home 1 and nursing home 2** (n=72)	**All observations** (n=251)
Recorder observed :			
understaffing	26%	25%	24%
only formal breaks (ex. for meals)	73%	70%	68%
high time pressure	34%	26%	29%
Workers report to be:			
working under deadlines	24%	22%	22%
deadlines happen often	23%	24%	21%

Table 9: **Survey and qualitative data**: Workers' knowledge of the reporting system

	SURVEY Data				QUALITATIVE Data
	All workers (n=229)*	**Workers with no injury** (n=200)	**Workers with injury** (n=29)	**Workers with health problems at work** (n=113)**	
Workplace has policies on reporting workplace injuries	96%	95%	97%		*"The policy states that the employees report all work related injury/illnesses to his/her department head, supervisor or designee. The employee and/or supervisor will fill out the ...form and report to the Employees Health or the Emergency department.....The injured worker will then report to the triage nurse in the Emergency department. Discharging nurse will complete injury/accident report. Cross –reference will involve Infection Control." (Hospital's policy)* *"When you are completing an injury report for an employees hurt at work, there's a special form to be used. Every question needs to be completed- all 22 of them. Incomplete forms can not be processed." (Hospital's employee newsletter)*
Workplace has policy to support reporting				73%	*"They're supposed to [report]. Immediately, you get injured with something or get hurt, you're supposed to report it at once to the nurse or the person in charge of the floor where you work."(Hospital employee)*
Received training to improve workers' health and safety (average=3 hrs)	59%	62%	45%		*"[Our facility] asks all employees to report all injuries, regardless of their severity (even if no first aid is required). This is communicated to employees at their orientation."(Hospital administrator)*
These incidents are usually reported in this workplace				45%	*"But, in reality a lot of people don't report a lot of things"(Hospital employee)* *"[…] You fill out a form. You go to the emergency room. You wait for three hours. [Laughter] […] Nobody taking over for you while you're going through the formal process. Man, because it's an onerous process." (Hospital Nurse).* *"Yes. Yes, you have to write out an incident report for injuries, of course, so they follow through. I've been stuck be a needle in the past year, and that's a nightmare." (Hospital Nurse)* *"They [laboratory technicians] don't have time to go waste down in the ER or the ED to have themselves checked out." (Lab director)* *"[…] you're just too exhausted […]. It's just one more thing […] more paper work. They're (the incident reports) designed, I think, to (keep you*

					from filling them out) they're complicated." (Nurse)
Did not tell anybody because[a]:				43% n=47 100%	
Did not think was serious enough				40%	*"They don't, you know. So it goes unreported unless they break a skin or something that you have to be tested for." (Hospital nurse)*
This is part of my job				16%	*"It's a job expectation. […] What did you expect, you are an ER nurse, what did you think? It was going to be easy?"* *"We get yelled at with four letter course words and we get it from family members, doctors and residents. And that's part of our job […]. If you don't have thick skin, you don't belong in nursing" (Nursing home employee).* *"It's like working with animals and you went in, you know that they're going to bite some time, but you are prepared" (Nursing home employee).*
Did not think it was related to my job				8%	
Other				36%	
Told about it[a]:				57% n=61 100%	
Told to supervisor				77%	
Was given attention				46%	*".. they[nursing supervisors) are up there before we know it helping us out", "they make it easy for us to write out our incident report in the computer"(Nurse)*
Was given time off				15%	
Safety was upgraded				10%	
Was told to be more careful I future				13%	*"[…] When you go down to report it you're made to feel like you did it yourself. Like, what could you have done to prevent it, (as if) you did it on purpose […]."*
No action was taken				34%	*"because you're talking to a wall, deaf ears. It's easier to just take Motrin and go on working instead. " (Nurse)*

Note: *These questions were asked only in the second administered survey: they represent a smaller number of workers (229 vs. 480);** a subset of questions was asked only to workers who had experienced musculoskeletal diseases, needle stick injuries and assault at work in the previous year; [a] answers are not mutually exclusive.

Table 10: **Survey and qualitative data**: Workers' knowledge and experience with the workers' compensation system

	SURVEY Data				QUALITATIVE Data
	All workers (n=229)*	**Workers with no injury** (n=200)	**Workers with injury** (n=29)	**Workers with health problems at work** (n=113)**	
Knows about the WC system because a:	81% n=186 100%	81% n=161 100%	82% n=25 100%		
Filed WC	15%	10%	45%		
Knows somebody who filed for WC	30%	30%	30%		
Employer Informed about	37%	37%	39%		*"[…] There is a grievance procedure. Human resources is always available, and they make it pretty well known that they're available, they want to be used, please call us if you have an issue. They certainly talk about that it in orientation, I know".*
Other	20%				
Agrees that[a]:					
Injuries happen to most people with this occupation	34%	26%	79%		
Who files for WC could be discriminated against	23%	20%	42%		*"Once you get injured people start to think you are a careless worker, you are not careful; you are too risky to be working in a nursing home. […] You get that in your mind and that's when it inhibits you from coming forth and saying that you hurt yourself" (Nursing home employee).*
Who files for WC could lose his/her job	33%	31%	43%		
Who files for WC might lose promotions/opportunities	27%	24%	44%		
Health care providers do not want to treat WC cases	38%	33%	60%		*"I'm a ping pong ball. My primary care physician will not see me because it's work related matter. I have to go to the specialist and the specialist just discharged me because the neurologist was reporting on the case...." (Nursing home employee).*

Did not file for WC because a:				92% n=110 100%	
Did not know enough about WC				7%	
Thought problem was not work related				23%	
Injury was not serious enough				54%	
Did not expect to miss work				36%	
Worried about what employer, supervisor , coworkers may think				9%	*"We are not very nice to the injured nurses."(nurse)* *"When I came back the first after being hurt I was greeted with, so how much did you sue for? I kind of was stunned[...] and. said I don't know where this rumor started but I'm not the type that would sue. I want a job in nursing [...] and the first couple of weeks have been really difficult because nobody actually talk to me [...]" (Nursing home employee).*
Worried about future employment				5%	*"I had a workman's comp case at a hospital that I worked at before, and I am telling you what, I've never been treated so horribly in my life. So if I did get hurt here, even by a patient, I probably wouldn't even mention it because I felt like, at the other place, that I was applying for welfare. That's how lousy I was treated. And then after the third injury in a year, I was fired. And they knew it was their fault. So now I would never, ever file another workman's comp case."(Nurse)*

Note: *These questions were asked only in the second administered survey: they represent a smaller number of workers (229 vs. 480);** a subset of questions was asked only to workers who had experienced musculoskeletal diseases, needle stick injuries and assault at work in the previous year; [a] answers are not mutually exclusive.

Appendix

The PHASE project

In the late 1999, a diverse team of researchers from three University of Massachusetts Lowell (UML) colleges (health professions, engineering, and arts and sciences) responded to a National Institute of Health (NIH) request for application (RFA) that addressed the mechanisms resulting in health disparities. The RFA had a stated purpose to "….foster multidisciplinary research…" and indicated NIH's belief that the "…integration of qualitative and quantitative research methodologies …" would be needed to meet programmatic goals. The UML teams' proposal to study general health disparities, socio-economic status, occupational injuries and their long-term employment, economic and health outcomes among healthcare workers was accepted and funded by NIOSH (the National Institute of Occupational Safety and Health) under the name "PHASE in Healthcare" (Slatin et al., 2004.) As described in the text, the information collected in the course of the study was made of data of both quantitative and qualitative nature.

The PHASE study had a lot of turnover in research partners during the course of five years (Siqueira et al., 2005). Most of the participating health care facilities were recruited through PHASE researchers' professional and personal contacts with management of health care facilities in Massachusetts. Maintaining a good relationship with each of the participating facilities and increasing trust of researchers by management and workers were key to successful data collection. Each of the partnering organizations agreed to provide one person who would serve as a project liaison. The liaisons helped with ideas for improving relations and proposed revised recruitment and data collection.

A range of strategies was developed to attempt to increase employees' trust, interest and participation in the study. For example, PHASE researchers made presentations at department meetings. "Kick-off" events were held at each facility to give workers a clearer idea of what the PHASE project was proposing to do while giving them an opportunity to raise any concerns about the study and their participation. The study Outreach and Field Research Coordinator regularly visited the facilities giving a face to the project. At sites with a high percentage of immigrants, an effort was made to enlist those Brazilian, Haitian, and Hispanic employees who had a reputation of being informal leaders and who were interested in the study. This was done to raise the level of understanding and trust and to recruit fellow minority employees to participate.

Early in the recruitment period the PHASE project it became clear that the project somehow had to pay back for the time, support and involvement of its partnering health care facilities. The expertise of project researchers was utilized to offer both on-site educational sessions and training opportunities for both workers and managers and three successful conferences on worker health and safety. In addition, the PHASE project offered technical assistance to address specific needs: ergonomic assessment of specific working areas and employee workstations, and assistance to develop ergonomic plans.

Collection and data management procedures

For the Administrative Data: *Workforce rosters* included employee name, job title, work unit or department, hourly wage, type of contract (full-time, part-time or per diem),

date of hire, gender, date of birth (or age), race/ethnicity, US citizenship, work shift, pay period, hours worked per week, bonus eligibility, seniority in the job, and municipality or zip code of residence. *OSHA logs* described the injury and potential consequences such as days away form work and restrictive work days. Information from the *workers' compensation data* partially covered similar information to the OSHA logs but also included information about benefits payments.

Once the workforce data were received, employees' names were replaced with ID numbers to be merged with other data (the workers' compensation data and the survey data described below) except for the OSHA logs where the injured employee name was not available. OSHA logs could then only be analyzed at the level of job title. Job titles contained in the workforce data were codified according to the U.S Standard Occupational Classification (SOC) and merged with the *O*NET job exposure matrix*, a national, online database (available at http://www.onetcenter.org) administered and sponsored by the U.S. Department of Labor's Employment and Training Administration to provide information about job characteristics. Variables for the PHASE study were selected from the entire O*NET database (over 400 variables) to capture information about work demands or effort, job control, nature and level of skill utilization, emotional labor required, musculoskeletal requirements, requirements to work under dangerous physical or social situations or under a shift work schedule.

For the Survey Data: In order to maximize participation at all SES levels, it was decided that all job titles should be included in the target population. Workforce data obtained from each participating health care facility were used to examine the distribution of gender and race/ethnicity by SES in order to determine the sampling of survey participants. In the only hospital where survey data collection was possible (Hospital 2), there were very few employees who were Latino or in racial groups other than white. Because of the disproportionate number of female nurses, the sampling fraction for white, non-Latino, female nurses was 50%. The sampling fraction was 100% for all other job titles. All of these employees were approached regarding participation. For the nursing homes, which were smaller facilities, all employees were sampled.[23] While the respondents to the final two outcomes surveys were awarded with $25 incentive checks, the first epidemiological survey (EBQ) was not rewarded. Also, the surveys were available in Spanish for the Spanish-speaking worker population. Yet the illiteracy of immigrant workers in their native language and the variety of mother tongues among the workers caught the researchers off guard. The most effective way to deal with this issue was to orally translate the survey to small groups of Spanish, Haitian Creole and Portuguese speaking workers while they filled it out.

[23] Prior to the administration of each survey a pilot study was conducted. Based on the results of the pilot studies, the surveys were modified. The final instruments were entered into *Cardiff Teleform* scanning software to enable the returned surveys to be scanned for the purpose of minimizing the potential for data entry errors.

For the Observation Data: An ergonomic exposure assessment tool based on the PATH method [Buchholz, Paquet et al. 1996] was developed to categorize the exposures of health care job titles. *PATH* is an observational work-sampling based tool designed to capture exposure to multiple work-related risk factors for musculoskeletal disorders. PHASE researchers redesigned the PATH instrument to add more information about upper extremity stressors. They observed different body parts postures and activities within single 90-second observation cycles. Observers collected data in hand-held personal digital assistants (PDAs). All PDAs were equipped with touch screen technology, which facilitates field data collection via a stylus pen.

The ergonomic exposure assessments had to be done during work time and that was not a problem for the employers because the workers did not have to take any time off from their regular duties. The observers shadowed workers without interfering with their tasks. However, the researchers faced some difficulties when recruiting volunteers. Shadowing was a new concept to most non-patient care workers (nurses and nurses aids are familiar with it from their training) and despite the assurance that no performance evaluation would be done some workers remained suspicious about the ergonomic exposure assessments. In other departments, supervisors were reluctant to provide access, either because of concerns about patient confidentiality or time constraints.

For the Qualitative Data: Interview and document review guides were derived from a "PHASE Case Study Matrix" prepared by qualitatively oriented researchers to outline areas of inquiry and potential sources of information.

Documents were requested from participating facilities, copied and scanned. The documents that could not be scanned were summarized.

Managers and administrators were recruited in person for interviews and the 60-90 minute interviews were held on work time. Most of the interviews were audio taped and transcribed by a professional transcription service with interviewees' permission. Field notes were used for analysis in cases where the interviewees refused to be taped.

Input from workers was collected using different formats (Table A1). Because employers did not allow focus groups on work time the plan was to have them at shift changes so that most workers would have a chance to participate either by coming to their workplace early or staying late. It soon became clear, however, that the $25 participation incentive and complementary refreshments were not attractive enough to make people with very heavy work load, scheduled overtime, childcare responsibilities, second jobs and overall busy lives to change their schedules. The focus group protocol had to be revised. The discussion time was decreased from 60-90 minutes to 30 minutes and the groups were usually held during workers' lunch breaks.

Table A1: Sources of qualitative information among employees

Type of facility	Number of facilities	Personal interview (1 person)	Small focus group (2-3 persons)	Focus group (4-6 persons)	Open forum (11-30 persons)
Hospital	2	3	2	-	4
Nursing home	2	-	-	14	-
Union	1	-	-	9	-

All qualitative data, scanned or summarized documents, transcripts from key informant interviews, and transcripts from workers interviews, focus groups and open

forums were organized and analyzed using the qualitative research software *N-Vivo, Version 2*[24]. They were analyzed independently by a minimum of 2 researchers who assigned codes to the transcripts together by consensus using the framework established in the research design. An iterative analytical process examined agreement and contradiction across the multiple data sources – workers, managers and administrators, documents and records, and other sources used to understand the contexts of healthcare workplace injuries.

About Confidentiality: The PHASE project had to gain approval of two Institutional Review Boards (IRB) to conduct the study: the University of Massachusetts Lowell IRB and one hospital's IRB. An Informed Consent Form (ICF) was designed for each participating facility and union and approved by the appropriate IRBs. The ICSs explained the study methods and risks of being involved in the study. The ICFs were also available in Spanish. The signed Informed Consent Forms were kept in locked filing cabinets in the PHASE office. A copy of the form was also given to every participant for his/her records.

[24] QSR International Pty Ltd