FINAL PERFORMANCE REPORT

THE ROLE OF SOCIAL NETWORKS IN WORKPLACE INJURIES

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9/30/2000 to 9/29/2003
Supported by NIOSH grant R03 OH004203

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Abstract

The objective of this study was to explore the role of informal social ties among healthcare workers in the risk of injury and assault in the workplace. The main hypothesis was that groups of workers that had greater worker cohesion in the form of friendship and "helper" ties have lower rates of injuries and assaults. A cohort of nurses and Certified Nurse Assistants (CNAs) working in a dual diagnosis (psychiatric and medical) facility was followed for sixteen months. Social network methods (sociometrics) were used to quantify informal social relations among study participants. Study results indicated that physical demands in the form of resident lifting (log of lifts per shift) and resident combativeness (log of combative events per shift) were important predictors of injuries and assaults respectively (for injuries OR = 1.4, 95% CI = 1.1, 1.7, for assaults OR = 1.3, 95% CI = 1.1, 1.6). Results showed little support for the original hypothesis. However, this was likely due, in part, to poor survey response. To overcome poor survey response, a "workgroup regular" variable was created using available shift schedule data to measure worker integration without using individual survey responses. This variable identified which workers had repeatedly worked on the same floor and shift in the previous two months (on average) and were working on their usual floor for any given shift. The workgroup regular variable was positively associated with risk of injury and assault (for injury OR = 1.7, 95%, CI = 1.0, 2.7, for assault OR = 2.0, 95% CI = 1.3, 3.2). A new hypothesis was generated suggesting that the culture of caring among nurses may have led integrated workers to take more risks in the form of greater resident contact than non-integrated workers. It was recommended that more research be done on this subject and that the culture of work be considered in future attempts to understand the social dynamics of the workplace and how these may affect safety in the workplace.

Significant Findings

Epidemiologic research has identified a variety of factors that modify the risk of work-related injuries. These include physical safety hazards, unsafe work practices, and ergonomic stressors. But despite this body of research and many attempts to reduce these known risk factors, the rate of injuries among nurses and certified nurse assistants (CNA) has been fairly stable, and unfortunately high, over the past decade. This study focused on the roles that social networks play in modifying the effects of workplace hazards. We hypothesized that a better understanding of the ways in which social networks can modify the risk of injuries could provide new strategies for injury prevention.

Since the focus of this research was on the relations among workers, not properties of each individual worker, this study was an opportunity to open new perspectives on the etiology of workplace injuries that go beyond individual worker characteristics. The study results, while far from conclusive, provide important insights into the roles of social factors in the injury process and have generated new hypotheses for future research in this area.

The frequency of patient lifting was found to be an important predictor of injuries. This risk was primarily observed among the CNAs, who do the bulk of the lifting, according to staff interviews. Combative behavior by the residents was a predictor of assaults, and this too was primarily observed among the CNA staff. To illustrate these associations, the models predicted that a staff member (both nurses and CNAs) performing 55 lifts per shift (the 85^{th} percentile of the lifting distribution) had four times the risk of injury of someone performing just 4 lifts per shift (the 10^{th} percentile of the lifting distribution). Similarly, a staff member who experienced 20 combative events per shift (the 85^{th} percentile of the combative events distribution) had more than five times the risk of reporting an assault than someone with just one combative event per shift (again the 10^{th} percentile of the distribution).

The initial design called for questionnaires to gather data on the social networks among workers. Unfortunately, this approach was found to be of limited use because of widespread refusal to participate in the surveys. We then developed measures of "familiarity" that could be evaluated without individual survey information. It was hypothesized that working with familiar coworkers means that one knows the routines of others and so can better coordinate actions than if working with unfamiliar persons. This hypothesis was rooted in the sociological work of Peter Blau who argued that repeated interactions among individuals leads to greater cohesion among group members. The more individuals interact with other group members, the greater the extent to which they become part of the group and are subject to its norms and expectations. This perspective was adapted to this study to support the notion that repeated interactions among coworkers, seen in staffing records, indicated a greater connectedness to the group.

Using only work rosters, it was possible to identify which workers were consistently present on any given floor and shift. The analyses of injuries and assaults to nurses and CNAs showed that workers were at an increased risk of injury and assault while working on the floor and shift they worked regularly (for injury OR = 1.7, 95% CI 1.0, 2.7, for assault OR = 2.0, 95%

CI 1.3, 3.2). These associations remained after controlling for group-level physical exposures including resident lifting and hostility, and previous injuries and assaults (for injury OR = 1.5, 95% CI 0.9, 2.4, for assault OR = 1.8, 95% CI 1.1, 2.9). Workers who were not regular members of a workgroup were at *lower* risk of both assault and injury. This group included both those who were working on a floor or shift that was not that person's regularly assigned floor and those who were new hires, without sufficient time on the job to become a regular member of any workgroup.

Familiarity, which one might hypothesize would be associated with social support, was not protective of workers, but indeed *increased* their risk. This rather surprising finding, if supported by future studies, suggests that social integration may do more than protect workers. On the basis of these findings, we have hypothesized that being socially integrated into a workgroup can subject a worker to the norms of the group, which put its members at risk of injury and assault by demanding they do more than their share of care for the residents. Because of chronic short staffing and the serious physical and psychological needs of almost every resident, the level of care demanded by the workgroup may often exceed the physical and emotional abilities of the staff. Those who are not workgroup regulars, by contrast, are at a relatively lower risk of injury or assault perhaps because they are not subjected to the same expectations regarding care for the residents.

These unexpected results may not be merely an anomaly or an artifact of the data. Rather, we think the significance of social relations at the workplace was under-theorized when the original hypotheses were stated. We believe we focused too heavily on the mere presence of connections without considering the cultural setting in which these connections exist. In particular, we think the culture of caring that exists in the ethos of the nursing profession led integrated individuals to put themselves at risk by providing more care for their residents than the less integrated workers. We also speculate that repeated interactions with residents may have led to a bonding between staff members and the residents for whom they provided care. These social bonds may have led the caregivers to be more attentive to their residents than those who did not have any meaningful connections with those under their care. This greater attentiveness, we hypothesize, led to the observed increase in risk of assault among all staff members. The shared social meaning of providing care among workgroup regulars, developed through repeated encounters with coworkers and residents may partially explain the elevated risks of injury and assault among workgroup regulars.

Usefulness of Findings

Additional research on the subject of worker social integration and informal relations at the workplace should take into account the meaning of work as defined by the culture of the workplace(s). If studying a single workplace, this would mean adding items to surveys, questioning individuals during interviews, or conducting ethnographic surveys.

Resident lifting was shown to be a significant risk factor for injury in this study. This is consistent with the published literature, and is perhaps the best understood of all of the risk factors that we studied. These data, when combined with previous studies, suggest that resident lifting devices may reduce injuries in this facility. We also recommend more research on resident handling exposures and suggest that researchers be aware of the possibility that informal social relations at work and the culture of work may have a role in the distribution of these exposures within the workgroup.

The quality of care delivered by workgroup regulars may well be higher than by non-regulars because they may go further in serving their residents. To be familiar with the residents may mean better care. To be integrated with one's coworkers also often leads to better job satisfaction, which in turn is linked to reduced absenteeism and turnover, which also play an important role in the quality of care. These findings demonstrate some of the ways in which social cohesion among healthcare workers is tightly linked with nearly all aspects of the healthcare work environment. Much more research would be needed before one could make recommendations that attempted to directly change worker social cohesion – either increasing or decreasing it – in the belief that this would improve safety at work.

At a minimum, though, it may be useful for administrators and staff members to discuss and learn about the norms of care and of helping that exist in the workplace. Simply making staff members aware of the risks associated with the culture of caring and the social rewards of sacrificing oneself may be a step to reducing injuries. Burnout is a well-described condition among caregivers, and it might be helpful in training for new employees that they are made aware of the potential hazards of offering too much of themselves. It may also be useful for safety practitioners to be aware that a workplace's culture can limit the effectiveness of their efforts to reduce safety hazards.

It would seem prudent to recommend that workers who are assaulted repeatedly by the same resident be removed from caring for that resident. This might be beneficial if the recognition of the caregivers by the residents is part of the behavior that leads to the patient's combativeness. This may lead to a trade off in care since those who the residents know well may be more able to calm the residents than those with whom the residents are unfamiliar. However, it is not clear from our data whether rotating workers among residents would reduce overall assault rates, or if it would make assaults more evenly distributed among all staff members.

The most important recommendation to make from this study is for more research on the roles of social factors such as group cohesion and the norms and values of workers in the etiology of injuries at work. This pilot study suggests that culture and social group dynamics may be putting individuals at an elevated risk of injury and assault. However, being a small study, these results must be heeded with caution. These results were not expected and must be corroborated in additional studies. In addition, the complexity of the social world must be respected when attempting to understand the importance of social contexts on injury, assault or any health outcome. In some settings, in or out of the workplace, the "right" culture and social environment may lead those who are integrated with such a culture to have lower risks of injuries and/or assault as was expected at the outset of this study. Much more research is needed in a variety of settings to understand how the social context affects and can be used to improve health.

SCIENTIFIC REPORT

CHAPTER I.
INTRODUCTION

The purpose of this dissertation was to explore the hypothesis that the informal social organization of the workplace, as measured by social network analysis, affects the incidence of work-related injuries. This epidemiologic study sought to apply established measures of social networks to describe the social organization of a workplace in order to examine the relationship between elements of the social context and workplace injuries. Social network analytic methods (sociometrics) were used to quantify the social relations among workers. Since this research focused on the social context of the workers, not properties of each individual worker, this study was an opportunity to open new perspectives on the etiology of workplace injuries that go beyond individual worker characteristics. The study results can be used to provide a better understanding of social factors in the injury process and to generate new information that might improve the safety of the workplace by broadening the available injury control strategies. This study was also an opportunity to span the disciplinary boundaries of epidemiology and sociology in order to broaden the range of theoretical and methodological approaches used in the study and prevention of occupational injuries.

Social position in a workgroup describes the way an individual relates to coworkers, and was considered a measure of the social context of the worker. Access to physical assistance from coworkers is a potentially important resource that might

help workers avoid injury on the job, and was the instrumental element of the social context that was measured in this study. The role of emotive elements of the social context was explored by measuring patterns of informal social ties (friendships) among workers.

This research was based upon a sixteen-month mixed prospective and retrospective study of nurses and nurse aides working in a dual diagnosis (psychiatric and medical) nursing facility. Subjects were surveyed so that the structure of two social relations could be measured: the provision of physical assistance and social support (friendships). The objectives were met by the following specific aims:

1. Measure the structure of the workplace social networks by:
    a. Examining the work records of a cohort of nurses and nurse aides working in a psychiatric hospital over a sixteen-month period to acquire social relations data;
    b. Identifying network boundaries at the level of the workgroup (defined by day, shift and unit in the hospital) and of the entire workplace, using employee work attendance records; and
    c. Generating social network measures that characterize the "social connectedness" of workgroup members, as well as each member's access to the group's resources.
2. Test the following hypotheses about the role of social network structures in the risk of injury at both the individual and group levels:
    a. Individuals who are able to call upon coworkers for physical assistance

in hazardous circumstances are less likely to be injured; and

b. Individuals who are socially connected to their coworkers (through friendships) are less likely to be injured.

The ultimate goal of this research was to generate new information that can reduce the risk of workplace injuries. Evidence to support the hypotheses above might lead to new consideration of organizational factors, such as staff scheduling practices, that influence cohesion and cooperation among workers. An understanding of the role of group structure might also aid in training efforts designed to implement safer procedures.

This pilot research was intended to provide the basis for a more extensive use of social network analysis in larger studies investigating additional social factors in occupational health and safety. Future research may demonstrate the utility of the social network approach in the epidemiologic study of other aspects of occupational health such as injury reporting behavior, work-related stress and absenteeism.

Occupational Injuries Among Healthcare Workers

The direct and indirect costs of acute occupational injuries remains high at $145 billion annually, greater than the estimated costs of AIDS and Alzheimer's disease combined (NIOSH, 2001). The national incidence rate of non-fatal occupational injuries in 2001 for all private industry was 5.4 per 100 full time workers (Bureau of Labor Statistics, 2002). In the same year, the rate of injuries among those working in the health service sector was 6.7. For workers in nursing and personal care facilities, the rate was 13.0 per hundred full-time employees, more than

twice the national average (Bureau of Labor Statistics, 2002).

While these estimates attempt to account for all work-related injuries, most data on occupational injuries in the US are based on reports from the Bureau of Labor Statistics. These include only injuries defined by OSHA as reportable: those that "result in lost worktime; require medical treatment (other than first aid); or if the worker experiences loss of consciousness, restriction of work activities or motion, or is transferred to another job" (Bureau of Labor Statistics, 1997). The rate of less severe injuries is likely much higher. In a recent study, the incidence rate of only one subset of reported injuries, back and shoulder injuries, was 45.8 per hundred full time employees per year among nurse aides working in a nursing home in Washington state (Myers, *et al,* 2002).

Occupational Assaults Among Healthcare Workers

According to a recent NIOSH report, the rate of non-fatal assaults among hospital workers was over four times the rate for all private sector workplaces (NIOSH, 2002). Arnetz, *et al* (1998), state that many studies report that healthcare workers are at a particularly high risk of experiencing violence at the workplace and that healthcare workers greatly underreport violent incidents at work.

In this study, injuries and assaults were analyzed separately. Since all reported assaults in this study were the result of violent actions made by residents living in the facility, they were viewed as etiologically distinct from non-assault injuries.

Social Factors in Epidemiology

The prevention of occupational injuries has largely been viewed as either a technical problem, or one requiring changes in individual behavior (Shannon, *et al*, 1996). Several authors have noted that the social environment has been under-studied as a potential source of prevention strategies (Diez-Roux 1998; Link and Phelan 1995; Shy 1997; Veazie 1994). Over thirty years ago Cassel (1964) argued that epidemiologists ought to look to the social sciences for a "new or modified model of disease causation." More recently, Shy and Diez-Roux have made similar arguments, calling for a broadening of the field of epidemiology to include social science perspectives and for more attention to the social context and the "human variables" in epidemiologic research (Diez-Roux 1998; Shy 1997). In addition, the examination of the role of work organization issues in occupational injury etiology is a NORA research priority (NIOSH, 1999).

Link and Phelan (1995) note that, in epidemiology, social conditions have received less attention than the more proximal "causes" of diseases. They use existing epidemiologic literature to illustrate their conception of social conditions as "fundamental causes" of health outcomes. According to their view, access to certain resources plays an important role in the risk of a variety of health outcomes. They argue that some resources "help individuals avoid diseases and their negative consequences through a variety of mechanisms." Among their list of important resources are knowledge, prestige and "social connectedness." This study uses this perspective to explore the role of social conditions in the risk of acute workplace

injuries. The transfer of energy is recognized to be the proximate "cause" of workplace injuries (Hagberg, *et al*, 1997). However, social conditions in the workplace are hypothesized to modify the risk of injury by modifying workers' exposures, and these less proximal causes of injuries will be the subject of this study.

Link and Phelan define social conditions as "factors that involve a person's relationships to other people. These include everything from relationships with intimates to positions occupied within the social and economic structures of society" (Link and Phelan, 1995). The emphasis on social relations makes this definition of social conditions strongly resemble the concept of "social position" as used in social network analysis (Burt, 1991). Therefore, social network analytic concepts and methods will be used to quantitatively characterize social conditions in the workplace so that their role in the incidence of workplace injuries can be explored.

Social Network Analysis

In the field of sociology, studies demonstrating the importance of social relations among workers go back at least as far as the Hawthorne experimental studies of the 1930's (Roethlisberger and Dickson, 1939). Unfortunately, these groundbreaking studies of social interactions among workers are usually only remembered for demonstrating the impact of an investigator on the phenomenon under investigation. Methodological advances during the 1970s and 1980s have led to exponential growth in the range of application of social network analytic techniques (sociometrics) (Wasserman and Galaskiewicz, 1994). Many other studies have since used sociometrics to demonstrate the effect of workgroup social relations

on a variety of outcomes including: attitudes (Burt, 1982, Rentsch, 1990), job satisfaction (Iberra and Andrews, 1993), turnover (Krackhardt and Porter, 1986, Price and Mueller, 1986), burnout (Anderson, 1991) and absenteeism (Krackhardt and Kilduff, 1990). In a well-known study of social contagion, Kerckhoff and Back partly attributed the spread of physiologically unexplainable illness among Montana mill workers to patterns of social contact with coworkers (Kerckhoff and Back, 1968). Despite this body of literature, very little epidemiologic research has been done to investigate the potential impact of workplace social relations on the risk of work-related injuries (Veazie, 1994).

The Social Network Perspective and Risk of Injury

The social entities upon which sociometric measurements are taken are referred to as *actors*. In this study, the actors are individual workers. A *relation* is defined as the pattern of interaction between two or more actors. A *social network* is the combination of a finite group of actors and the relations among them. To social network analysts, persistent patterns of interaction among members of a group define the structure of the social network (Wasserman and Faust, 1994). Patterns of interaction among workers are important because they represent channels or opportunities for the spread of resources throughout the group.

Within a social network, there are social "positions" (also referred to as "locations"), that members occupy. Social positions in the group are conceived of as the intersecting pattern of relations one has with the other group members (Burt, 1991). Since social position in a workgroup describes the way one relates to

coworkers, position is considered a measure of the social context of the worker. Important elements of the social context include access to resources, control over resources, social prestige and social support (Link and Phelan, 1995).

Resources such as information about work procedures, physical assistance and social support from friends are hypothesized to modify the risk of injury in the workplace. these resources represent the two fundamental kinds of relations that are studied by social network analysis: instrumental relations and emotive relations (Wasserman and Faust, 1994). Instrumental relations involve the flow of goods or impersonal services such as money or information. Emotive relations are highly personal and indicate the flow of things like trust and friendship (Ibarra and Andrews, 1993). In this study, both instrumental relations (information and help sharing) and emotive relations (friendships) are measured.

Social Position and Individual Attributes

Although individuals are assigned scores representing their position in the social network, a position is not an *attribute* of an individual. *Position* refers to the manner in which an individual relates to other group members, while *attributes* are properties of individuals themselves. Social position and individual attributes such as gender and age are often correlated (Burt, 1991). Social network analysts suggest that one's position in the group, one's social context, underlies the observed association between individual attributes and risk of injury. This suggests that if data on positions and the attributes correlated with them were both entered into a statistical model of risk of injury, the position is expected to explain some of the risk allocated

to the attributes. While many epidemiological studies have demonstrated associations between attributes of individuals and risk of workplace injuries (Veazie, *et al*, 1994), this study examines social position along with individual attributes to test the hypothesis that the social context explains observed associations between individual attributes and risk of injury.

Figure 1 illustrates the social network perspective. Observed associations between actor attributes and an outcome, represented by the arrow on the right side of the triangle, are thought to be spurious, or proxies for social positions. The perspective suggests that these associations reveal themselves because of the correlation between attributes and social position within the social structure. This attribute-position correlation is represented by the dashed line on the left. The network perspective suggests however, that it is the manner in which an individual relates to others in the group, one's "position" or "location" within the social structure, that explains the outcome. This "fundamental" association is represented by the dark arrow along the bottom.

The association between a worker's tenure and risk of injury is an example of an attribute—injury relationship that may be better explained by social position. In a study of injuries among nurse aides (Myers, *et al*, 2002), new employees were found to have an elevated risk of injury. Being new is correlated with position in the workplace social network. In particular, new workers are generally not as socially *integrated* as the standing workers are. In other words, new workers interact with coworkers less than the more tenured workers interact amongst themselves (Jablin,

2001). Their lack of social ties to coworkers prevents new workers from getting risk-reducing resources. One is led by this example to consider the new worker's social position within the workplace as a potential explanation for the observed elevation in risk to new workers.

The scope of the social network perspective is not restricted to an analysis of what it means to be a new group member. Other workers may be in social positions similar to those of new workers for other reasons. Gender and ethnicity are attributes that may place individuals in certain potentially harmful social positions in the network structure. For example, males working amongst a group of mostly female coworkers in a nursing home may be called upon more than female coworkers to provide assistance in the lifting of patients. Under the same circumstances, males may be less likely to go to female coworkers for help with tasks such as lifting. In this hypothetical but plausible example, males would have higher demands put upon them by the nature of their interaction with their coworkers because they would be approached to do more lifting and they would be less able to get help from others.

Determining that position matters makes it important to see why people hold certain positions. Different strategies might be needed to overcome any negative effects of social position if people occupy dangerous positions for different reasons. However, it is the effect of occupying certain positions within the group, not the reasons for holding them, that is the subject of this study.

Social Networks and Injuries Hypotheses

There are numerous workplace hazards faced by nursing and personal care

workers: violent patients, excessive manual lifting, psychological risks, chemical hazards, infectious agents and the handling and disposal of sharp objects such as needles are a few (Sterling in Charnay 1994). The social structure of the workplace is hypothesized to modify the risks of these workplace hazards. In general, the more one is connected to coworkers, the lower the risk of injuries to the workers. It is hypothesized that the resources of information, physical assistance and social support from coworkers can help individual workers avoid workplace hazards. The greater the degree of social interaction that exists in a workgroup, the greater the flow of potentially risk-reducing information, assistance, and support for each other. Safety in the workplace, it is thus hypothesized, is partly a function of the workgroup's social structure and one's position within the group.

Physical Assistance—Nurses are known to have high exposures to manual lifting (Smedley, *et al*, 1995). In a study of nurses, Owen (in Charnay, 1995) found that the second most frequent suggestion to avoid back injuries was "that nurses be more willing to ask for help when they had judged they should not attempt the PHT [patient handling task] alone" (p. 334). The provision of physical assistance is expected to reduce injuries by distributing physical workloads more evenly. The ability to call upon one's coworkers for help is expected to reduce injuries because greater assistance is expected to reduce extreme physical loads. Since the help from another coworker can reduce physical loads, it is hypothesized that the availability of help from coworkers will reduce risk of lifting injuries, particularly back and shoulder injuries.

Friendship—Friends have a greater level of concern for the well-being of each other than are workers who are not friends (Albrecht and Adelman, 1987). Friends are more likely to warn each other about workplace hazards and to *offer* assistance to each other. It is hypothesized, therefore, that the greater the degree of friendship an individual experiences at work, the lower the risk of injury. The potential safety benefits of working with friends are explored in this study.

Physical Loads--Physical workloads are expected to vary across individuals. Selected questions from the Job Content Questionnaire (Karasek, 1985) were included in the survey so that physical workloads can be measured. Physical workloads were also measured so that these exposures may be accounted for in statistical models. Questions like "How many times per day do you lift patients?" that reflect the types of hazardous exposures particular to the health care setting will be used to measure physical exposures.

Individual-Level Confounding Variables--Individual level confounders that were measured and accounted for in the analyses include age, gender, ethnicity and tenure. Age, gender and tenure were found to be important variables in previous research (Myers, *et al*, 2002). Subjects will be asked if they have other jobs to control for the potential effects of fatigue.

Study Setting and Population

This study setting was a 122-bed long-term care facility in New England. The population members cared for were referred to as residents. This was "dual-diagnosis" facility in that its residents had behavioral or psychological disorders as

well as physical ailments. In all cases the psychological conditions had caused the residents to be discharged from other institutions that had found them too demanding. It was therefore a generally more challenging and even hostile environment than would be found in a standard nursing home.

There were 339 individuals in the study, 102 nurses and 233 CNAs (four missing job title). According to the shift schedule data (described below), eighty-one nurses and aides provided coverage on an average day. Supervisors were not included in these analyses. The nature of work for supervisors in this institution tended to be highly managerial in nature. They worked mostly on the first shift and had a variety of duties and responsibilities. Finally, no supervisors reported any injuries or assaults during the study period so an analysis of the etiology of these events to this sub-population was not possible. A charge nurse occupied each floor on each shift. These individuals were included in all analyses. Also eliminated from this study were administrators as well as clerical, housekeeping, maintenance, kitchen employees and visiting physicians.

This institution had a three-tiered workforce: standard employees, per diem and pool workers. The term “standard employees” represented workers fully associated with the institution, that is, they were paid (with benefits) by the facility and were expected to work when available and needed. Per diem employees were paid directly by the institution but they worked on a call-in basis. Per diem employees earned a 15% premium in pay compared to standard employees but they received no health coverage or other benefits, as did standard employees. Pool

workers were nurses and CNAs who were employed and paid by an external agency but who provided coverage for the study facility on a call-in basis.

Data Sources

Employee rosters were gathered from the institution's head office three times during the study period. The *shift schedule* data consisted of attendance records of all nurses and aides. These records were generated and maintained by two Schedule Coordinators. These data included daily records of work attendance and indicated which floor and shift each staff member worked on. *Injury and assault* data were maintained by the institution's Medical Records Administrator who recorded all injuries and assaults reported by all employees. These records provided variables including name and employment status of those reporting the event as well as the date, location, time and shift on which the event occurred. In addition, the incident reports provided type and nature of incident, body part affected, treatment provided (indicating severity) and a short prose description of the event. *Injuries* in this study included all acute, at-work incidents that were reported by nurses or aides excluding those described as a involving abusive behavior by the residents. *Assaults* were all events in which a staff member reported some kind of abuse by residents and could include events in which no noted physical harm was done. Only the self-report of an event was required for inclusion. Two rounds of *surveys* were administered to gather data used to examine the causes of the injuries and assaults in analyses reported in subsequent chapters. Survey data were available (at least one survey) for 56 of the 90

(62%) total injuries reported. The same was true of 69 of the 109 (63%) reported assaults.

In Chapter 2, injury and assault rates are summarized by floor, shift, job title, and employment status. Tables indicating the frequency of injury and assault by nature and type of event, body part and severity were created. This was done to provide a description of the events being analyzed in this dissertation. In Chapter 3, logistic regression models are used to analyze risk of injury and assault associated with network position as well as physical demands, job title, and employment status. A new sociological variable based on working with coworkers one usually works with was introduced and analyzed as a risk factor for injury and assault. Chapter 4 is a deeper analysis of the unexpected result found in Chapter 3, that workers who routinely worked on a particular floor and shift were at higher risk of injury than those who were not “regular” workers. In Chapter 4, new hypotheses were generated based on these findings. Chapter 5 is a summary of this dissertation and offers suggestions for further research and policies for the prevention of injuries and assaults in the workplace.

LITERATURE CITED

1. Albrecht, T.L., & Adelman, M.B. (Eds.). 1987. Communicating social support. California: Sage Publications, Inc.

2. Anderson, J.G. 1991. Stress and burnout among nurses: A social network approach. Journal of Social Behavior and Personality, 6(7), 251-272.

3. Arnetz. J.E., Bengt, B. and Soderman, E. 1998. Violence Towards Health Care Workers: Prevalence and Incidence at a Large, Regional Hospital in Sweden. AAOHN. March, 46(3).

4. Burt, R.S. 1991. Structure version 4.2 reference manual. New York: Columbia University.

5. Burt, R.S. 1982. Toward a structural theory of action. New York: Academic Press.

6. Cassel, J. 1964. Social science theory as a source of hypotheses in epidemiological research. American Journal of Public Health, 54(9), 1482-88.

7. Charney, W. (Ed.). 1994. Essentials of modern hospital safety volume 3. Boca Raton: Lewis Publishers.

8. Diez-Roux, A.V. 1998. Bringing context back into epidemiology: Variables and fallacies in multilevel analysis. American Journal of Public Health, 88(2), 216-22.

9. Hagberg, M., Christiani, D., Courtney, T.K., Halperin, W., Leamon, T.B., & Smith, T.J. 1997. Conceptual and definitional issues in occupational injury

epidemiology. American Journal of Industrial Medicine, 32, 106-115.

10. Ibarra, H., & Andrews, S. 1993. Power, social influence, and sense making: Effects of network centrality and proximity on employee perceptions. Administrative Science Quarterly, 38, 277-303.

11. Jablin, F. M. 2001. Organizational entry, assimilation, and disengagement/exit. In F. M. Jablin & L. L. Putnam (Eds.), The new handbook of organizational communication: Advances in theory, research, and methods (pp. 732-818). Thousand Oaks, CA: Sage.

12. Karasek, R., Pieper, C. and Schwartz, J. 1985. Job Content Questionnaire and User's Guide. Revision 1.1. Developed at Columbia University. Information from Dr. Karasek, Dept. of Work Environment, UMass./Lowell, MA.

13. Kerchoff, A.C., & Back, K.W. 1968. The June bug: Study of hysterical contagion. New York: Appleton-Century-Croft.

14. Krackhardt, D. & Kilduff, M. 1990. Friendship patterns and culture: The control of organizational diversity. American Anthropologist, 92, 142-54.

15. Krackhardt, D., & Porter, L.W. 1986. The snowball effect: Turnover embedded in communication networks. Journal of Applied Psychology, 71, 50-55.

16. Link, B.G. and J.C. Phelan. 1995. Social conditions as fundamental causes of disease. Journal of Health and Social Behavior extra issue: 80-94.

17. Myers D., Silverstein, B. and Nelson N. 2002. "Predicting Shoulder and Back Injuries in Nursing Home Workers: A Prospective Study". American Journal of Industrial Medicine, 41, 466-476.

18. NIOSH 1999. National Occupational Research Agenda Update: 21 Priorities for the 21st Century. Cincinnati: US Department of Health and Human Services, Public Health Services, Centers for Disease Control and

Prevention, National Institute of Occupational Safety and Health. Publication No. 99-124.

19. NIOSH 2001. National Occupational Research Agenda Update. Cincinnati: US Department of Health and Human Services, Public Health Services, Centers for Disease Control and Prevention, National Institute of Occupational Safety and Health. Publication No. 2001-147.

20. NIOSH, 2002. Violence: Occupational Hazards in Hospitals. Cincinnati: US Department of Health and Human Services, Public Health Services, Centers for Disease Control and Prevention, National Institute of Occupational Safety and Health. Publication No. 2002-101.

21. Price, J.L., & Mueller, C.W. 1986. Absenteeism and turnover of hospital employees. Connecticut: JAI Press, Inc.

22. Rentsch, J.R. 1990. Climate and culture: Interaction and qualitative differences in organizational meanings. Journal of Applied Psychology, 75, 668-681.

23. Roethlisberger, F.J., & Dickson, W.J. 1939. Management and the worker. Cambridge: Harvard University Press.

24. Shannon, H.S., Walters, V., Lewchuck, W., Richardson, J, Moran, L.A., Haines, T., & Verma, D. 1996. Workplace organizational correlates of lost-time accident rates in manufacturing. American Journal of Industrial Medicine. 29(3), 258-68.

25. Shy, C.M. 1997. The failure of academic epidemiology: Witness for the prosecution. American Journal of Epidemiology, 145, 479-84.

26. Smedley J., Egger, P., Cooper, C. and Coggon, D. 1995. Manual handling activities and risk of low back pain in nurses. Occupational and Environmental Medicine. 52;160-63.

27. United States Department of Labor. Bureau of Labor Statistics 2002. "National Census of Occupational Injuries, 2001" BLS News 2002. Washington DC: United States Department of Labor.

28. United States Department of Labor. Bureau of Labor Statistics. 1997. Occupational injuries and illnesses: Counts, rates, and characteristics, 1994. Bulletin 2485.

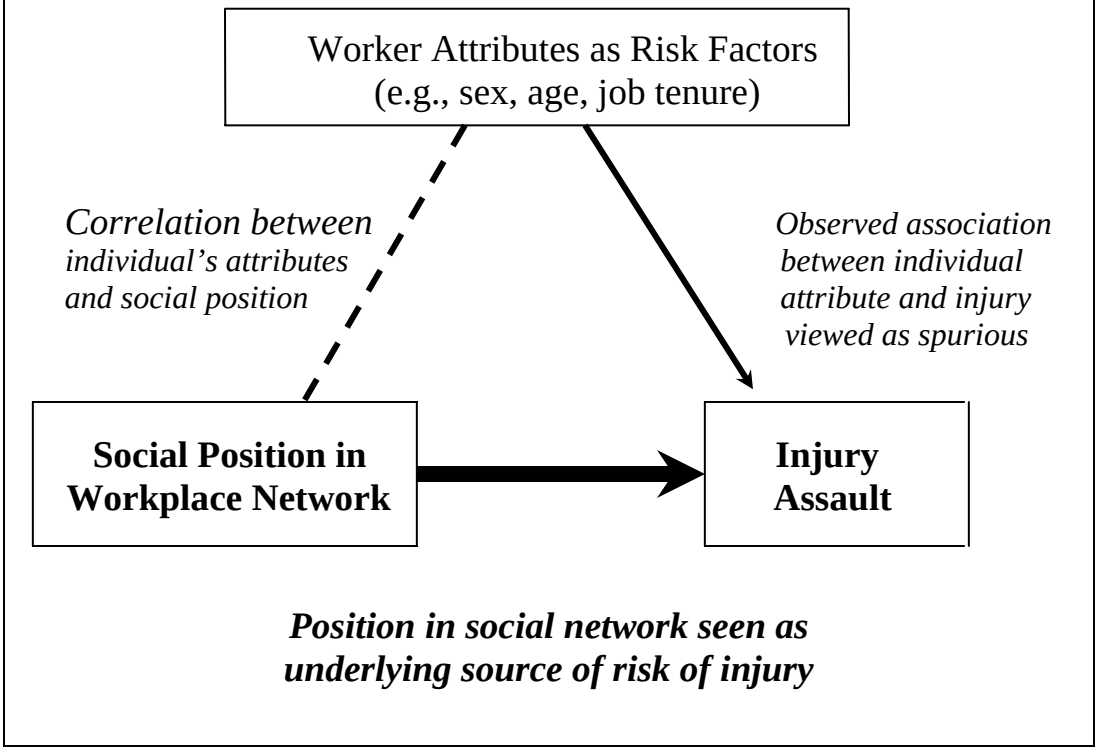
29. Veazie, M.A., Landen, D.D., Bender, T.R., & Amandus, H.E. 1994. Epidemiologic research on the etiology of injuries at work. Annual Review of Public Health, 15, 203-21.

30. Wasserman, S., & Galaskiewicz, J. (Eds.). 1994. Advances in social network analysis: Research in the social and behavioral sciences. California: Sage Publications.

31. Wasserman, S., and Faust, K. 1994. Social network analysis: Methods and applications. New York: Cambridge University Press.

FIGURES

Figure 1.
The Social Network Perspective
(Adapted from Burt, 1991)



CHAPTER II.
INJURIES AND ASSAULTS TO HEALTHCARE WORKERS: DESCRIPTIVE EPIDEMIOLOGY

BACKGROUND

Occupational Injuries Among Healthcare Workers

The direct and indirect costs of acute occupational injuries remains high at $145 billion annually, greater than the estimated costs of AIDS and Alzheimer's disease combined (NIOSH, 2001). The national incidence rate of non-fatal occupational injuries in 2001 for all private industry was 5.4 per 100 full time workers (Bureau of Labor Statistics, 2002). In the same year, the rate of injuries among those working in the health service sector was 6.7. For workers in nursing and personal care facilities the rate 13.0 per hundred full-time employees, more than twice the national average (Bureau of Labor Statistics, 2002).

While these estimates attempt to account for all work-related injuries, most data on occupational injuries in the US are based on reports from the Bureau of Labor Statistics. These include only injuries defined by OSHA as reportable: those that "result in lost worktime; require medical treatment (other than first aid); or if the worker experiences loss of consciousness, restriction of work activities or motion, or is transferred to another job" (Bureau of Labor Statistics, 1997, p. 5). The rate of

less severe injuries is likely much higher. In a recent study, the incidence rate of only one subset of reported injuries, back and shoulder injuries, was 45.8 per hundred full time employees per year among nurse aides working in a nursing home in Washington state (Myers, *et al*, 2002).

Occupational Assaults Among Healthcare Workers

According to a recent NIOSH report, the rate of non-fatal assaults among hospital workers was over four times the rate for all private sectors (NIOSH, 2002). Arnetz, *et al* (1998), state that many studies report that healthcare workers are at a particularly high risk of experiencing violence at the workplace and that healthcare workers grossly underreport violent incidents at work.

In this study, injuries and assaults were analyzed separately. Since all reported assaults in this study were the result of violent actions made by residents living in the facility, they were viewed as etiologically distinct from non-assault injuries.

Objectives

The objective of this paper was to describe of the distribution of injuries and assaults among nurses and nurse aides working in a long-term care facility. This served as background information in for subsequent risk analysis in which the role of social relations among workers in the risk of work-related injuries was examined. The goal was to determine how injuries and assaults varied by floor, shift, job title, employment status and age and sex of the worker. Injury and assault rates by severity, body part afflicted, type and nature were also determined.

METHODOLOGY

Study Setting

This study setting was a 122-bed long-term care facility in New England. The population members cared for were referred to as "residents." It was deemed a "dual-diagnosis" facility in that its residents had behavioral or psychological disorders as well as physical ailments. In all cases the psychological conditions had caused the residents to be discharged from other institutions that had found them too demanding. It was therefore a generally more challenging and even hostile environment than would be found in a standard nursing home.

The facility has four floors. The ground floor had 25 beds home to both male and female residents. The residents on this floor had the most severe behavioral disorders and, according to administrators, tended to be highly assaultive. The first floor had 35 beds for male and female residents with the highest degree of medical ailments and physical dependency. The second floor also had 35 beds. Its residents were all male. The third floor was an all-female floor and had 27 beds. Residents on the second and third floor had fewer physical ailments than first floor residents.

Study Population

There were 339 workers in the study, 102 nurses and 233 CNAs (four missing job title). According to the shift schedule data (described below), eighty-one nurses and aides provided coverage on an average day. Coverage varied by floor and shift.

The ground floor was staffed by 16.6 employees on an average 24-hour period. There were 25.9 on average covering the first floor across an average three shifts. There were 22.9 nurses and aides covering the second floor on an average day and 15.7 on the third floor. Coverage on the first and second shifts (7:00AM-3:30PM and 3:00PM-11:30PM respectively) was almost the same. On average the first shift employed 34.9 nurses and aides on an average day while the second shift used 31.3. However, during the overnight shift (11:00PM-7:30AM), there were on average 14.9 nurses and aides present in the building. Administrators reported that the first floor had the greatest coverage on average. They also declared that approximately 80 individuals were needed to cover an average day and that the first and second shifts were approximately equal in staffing levels.

The nurse category includes all Registered Nurses and Licensed Practical Nurses and individuals labeled "Medical Nurse." The CNA category includes Psychological Certified Nurse Aides, Restorative Aides in addition to standard CNAs. Supervisors were not included in these analyses. The nature of work for supervisors in this institution tended to be highly managerial in nature. They worked mostly on the first shift and had a variety of duties and responsibilities. Finally, no supervisors reported any injuries or assaults during the study period. A charge nurse occupied each floor on each shift. These individuals were included in all analyses. Also eliminated from this study were administrators as well as clerical, housekeeping, maintenance, kitchen employees and visiting physicians.

This institution had a three-tiered workforce: standard employees, per diem and pool workers. The term “standard employees” represents workers fully associated with the institution, that is, they were paid (with benefits) by the facility and were expected to work when available and needed. Per diem employees were paid directly by the institution but they worked on a call-in basis. Per diem employees earned a 15% premium in pay compared to standard employees but they received no health coverage or other benefits, as did standard employees. Pool workers were nurses and CNAs who were employed and paid by an external agency and who provided coverage for the study facility on a call-in basis.

Data Sources

Employee rosters were gathered from the institution’s head office three times during the study period. Each time, however, the data were in different formats and did not always contain the same fields. For example, on two rosters, hire dates were provided. On a third roster, instead of date of hire, “years of experience” was listed. Rather than entering job title for every person shift, these data were merged onto the shift data set. Rosters often did not include employees of very short duration. The roster data was supplemented with the shift schedule data as described below.

The *shift schedule* data consisted of attendance records of all nurses and aides. These records were generated and maintained by two Schedule Coordinators. In this facility the schedule was organized by job title, floor, shift, and date for each two-week period. This was the primary source of work records and was used to fill in job title and employment status missing from the roster and survey data (see below).

Missing date of hire could sometimes be estimated using this data source. When hire date was missing from the roster data and the first few shifts that were reported for a given worker were designated as "Orientation," the date of hire was estimated as two days prior to the first recorded shift.

Injury and assault data were maintained by the institution's Medical Records Administrator who recorded all injuries and assaults reported by all employees. These records provided the name and employment status of the individual. Included were the date, location, time and shift on which the event occurred. In addition, the incident reports provided type and nature of incident, body part affected, treatment provided and a short prose description of the event.

Injuries in this study were defined to include all acute, at-work incidents that were reported by nurses or aides excluding those described as a involving abusive behavior by the residents. *Assaults* were all events in which a staff member reported some kind of abuse by residents and could include events in which no noted physical harm was done. Only the self-report of an event was required for inclusion.

The incident report data provided short descriptions of each event. The event descriptions were examined for each of the 210 incidents recorded in the study period. Based on these descriptions, a few of the events were discarded. These included events such as a theft of property in a staff member's car, an infection (deemed a disease and not an injury *per se*) and one time in which at least one person was stuck in an elevator. The description of the events was also used to confirm the type of incident (injury or assault).

Severity of injuries and assaults was determined using the incident reports. Events were categorized as requiring no treatment, first aid, follow-up treatment by a physician or emergency room attention. Refusal of care was also noted.

For some events, mostly assaults, a "not applicable" code was recorded under the heading of treatment. Inspection of the event description led to the coding of these as requiring no first aid. Treatment data were often missing when no first aid was given. The description of the event was used to confirm that no first aid was applied.

Two rounds of *surveys* were administered to gather data used to examine the causes of the injuries and assaults in analyses reported in subsequent chapters. The only variables of significance to this descriptive report that were gathered in the survey were age and sex. Survey data were available (at least one survey) for employees affected in 56 of the 90 (62%) total injuries reported. The same was true of 69 of the 109 (63%) reported assaults. Where sex was not provided, the investigator reviewed first names provided in roster data to make a judgment. The staff schedule coordinator was consulted when there was any question identifying a subject's sex.

Shift attendance records were entered only for dates on which an injury or assault occurred. However, as a result of this sampling strategy, the denominator for calculating injury incidence rates had to be estimated. This was first done with regression analyses. The number of workers in attendance each day was modeled as a function of shift, floor, weekday/weekend status and an interaction term for shift

and weekend status ($R^2 = 0.81$). This regression model was then used to predict the number of nurses and aides who were working on days not entered in the dataset. This resulted in an estimated denominator of 40,468 person-shifts. The number of person-shifts was divided by 250 annual working days to get a total of 161.9 FTE work-years. This method was used to calculate incidence rates throughout the study. Incidence rates are reported per 100 full time-equivalent work-years.

A second method was used to estimate the denominator. This was done by multiplying the number of person-shifts that accumulated on the dates entered by the ratio of total days in the study period to dates entered. There were 485 days in the study period and 153 dates on which an injury or assault occurred and data were entered. The ratio of these was multiplied by the number of person-shifts in the entered data to estimate the denominator. This method produced an estimated 163.6 full-time equivalent work-years, a result that is 1.1% larger than the result obtained by the regression technique.

For subsets, such as floor or shift, the total number of person-shifts predicted by the regression model was multiplied by the fraction of the entered data in the given category. For example, 43.1% of the person-shifts entered in the data were first shift person-shifts. Therefore, the estimate of total person-shifts in the study period was the number of person-shifts predicted by the regression model times this fraction of person-shifts in the sub-sample that were first shift person-shifts.

The attendance records became the central dataset in this study, to which all other data were merged. Merging of the roster and survey data with the staff schedule

data was done using the identification numbers assigned to each subject. Survey and roster data were joined to each person-shift record for whom these data were available. When injuries and assaults were combined with the main dataset, the date of the event, in addition to identification number of the subject, was used during the merge. When time-varying variables that came from multiple data sources were created, data closest to each date was used.

The following formula was used to calculate incidence rates:

Equation 1.

$$\left(IR = \frac{events}{person-shifts/250} * 100 \right)$$

where events represented the number of injuries or assaults in a given category and person-shifts is the total number of person-shifts in the same category. Average cumulative incidence was estimated for injuries and assaults. This was calculated in a spreadsheet using the following formula:

Equation 2.

$$(CI = 1 - e^{(-\sum IR * \Delta T)})$$

where IR was the number of events divided by the total person-shifts from which the events occurred and ΔT was the number of person-shifts a full-time employee worked in a standard work-year. Since pool workers were not employees of the study facility their hire dates were unknown. Their first appearance was also unknown. They were therefore left out of the turnover calculations.

RESULTS

There were 233 CNAs and 102 Nurses (Table 1). There were three employment status categories in this workforce: standard employees (56%, N=185), per diem employees (18%, N=64) and pool workers (25%, N=82).

Tenure was measured as duration in years from the date of hire to the last date observed for each person in the sample. Thus it is the maximum time observed since each worker's date of hire. On average employees had worked at the facility for 2.6 years, with a median duration of 1.3 years. For CNAs the mean was 2.4 years, significantly lower than tenure among nurses which was 3.3 years ($p < 0.05$, two-tailed test). Data were available for 225 individuals, 160 CNAs and 65 nurses.

Among the 92 workers who completed surveys, the median age was 34 years. Nurses ranged from 25 to 59 years of age and had a median age of 44. CNAs ranged from 18 to 60 years and had a median age of 31. Nurses were significantly older than CNAs ($p < 0.05$, two-tailed test). Eighty-nine percent of the population was female (N=302). There were 37 males.

Ninety injuries and 109 assaults were reported among the nurses and aides during the study period (Table 2). Based on estimated denominators, the injury incidence rate was 55.6 per 100 FTEs per year. For assaults the rate was 67.3 per 100 FTEs per year. The risk of reporting an injury in a one-year period was 0.40 and the risk of reporting an assault was 0.47.

The incidence rate of injuries requiring no treatment was 25.5 per 100 full-time equivalent (FTE) employees (Table 3). For injuries requiring first aid only it was 5.6 per 100 FTEs. The incidence rate for more severe injuries increased slightly to 8.0 per 100 FTEs for events resulting in clinical care and 9.3 per 100 FTEs for events severe enough to require emergency room treatment.

The incidence of assaults had a steadily decreasing pattern with respect to severity. Assaults resulting in no treatment occurred at a rate of 42.9 per 100 FTEs. This rate dropped to 7.5, then 3.7 and 2.5 per 100 FTEs by severity category of first aid only, clinical care and emergency care.

Injuries and assaults were categorized by body part afflicted (Table 4). The incidence rate for back and shoulder injuries was 21.0 per 100 FTEs. For the head and face region the incidence rate was 4.3 per 100 FTEs. Lower extremity injuries occurred at a rate of 13.0 per 100 FTEs. Finally, for the upper extremities the injury incidence rate was 17.3.

Assaults had a very different distribution by body part. Seventeen assaults were directed at the abdominal region for a rate of 10.5 per 100 FTEs. The assault rate for backs and shoulders was only 4.3 per 100 FTEs while the head and face area was attacked at a rate of 19.1 per 100 FTEs. Upper extremities were the largest category of assaults with a rate of 30.4 per 100 FTE while lower extremities were almost never afflicted by assaults (3.1 per 100 FTEs).

Eight categories for the nature of injury and assault are reported (Table 5). In addition, there was a “No Injury” category for assaults that result in no reported

injury. The majority of injuries were sprains and strains (56.2%, N=50). The second largest category was contusions (20.2%, N=18), then lacerations and punctures (12.4%, N=11). Four events (4.5%) were deemed exposures. This included exposure to blood, urine and chemicals. Two injuries resulted in burns (2.2%), there was one reported joint inflammation (1.1%) and one fracture (1.1%).

The most frequent nature of assaults was for those that resulted in no physical injury (43.3%, N=39). The largest category that resulted in an identifiable injury was scratches and abrasions (25.5%, N=23). Ten assaults resulted in contusions (11.1%) and nine were exposures (10.0%). Exposures in the assault category include exposure to saliva. Finally, there were five sprains or strains (5.5%) and four lacerations or punctures that resulted from assaults (4.4%).

Type of injury or assault described the event that took place to cause the injury. Injuries and assaults were of different types and are reported separately (Table 6). The largest type of injury category was over exertion (35.5%, N=32). The second largest was being struck by an object (25.5%, 23). There were twelve falls on the same level (13.3%). Eleven events involved being struck against some object (12.2%). Six injuries (6.7%) were deemed bodily reactions. This included events such as swelling, sudden pain or spasms not due to overexertion and knees buckling under no apparent excessive force. Five injuries (5.5%) were due to rubbing or abrasion. There was one “caught in” type of injury (1.1%).

Six categories of type of assault were created for this study. The largest category was punch/kick/strike with 54 (55.5%). Scratches, with 21 events (21.4%),

were the second most frequent type of assault. This was followed by squeeze/twist/pull which had 13 reported events (13.2%). There were five spitting events (5.1%), four bites (4.1%), and one event in which a needle puncture resulted from a combative resident bumping a care provider (1%). Two other spitting events were recorded but were coded as punches or scratches as they were accompanied by these other elements of assault.

The data showed a steady drop in the incidence of both injuries and assaults across shift (Table 7). For injuries, the first-shift incidence rate was 76.9 per 100 FTEs per year. This dropped to 47.8 and then to 23.1 per 100 FTEs per year for the second and third shifts. The incidence of injuries requiring at least first aid was about half the overall rate.

There was a similar shift-dependent pattern to assaults. On the first shift the incidence rate was 87.1 per 100 FTEs per year. This dropped to 63.8 per 100 FTEs per year on the second shift and drops further to 29.7 per 100 FTEs per year on the third shift. The fraction of assaults that required at least first aid treatment was much lower than this fraction among injury events. That is, it seems that assaults tend to be less severe than injuries not due to abuse by residents. This may be misleading, however. It may be that it is more difficult to apply first aid to an event such as being struck by a resident.

The second floor had the highest rate of injuries (71.8 per 100 FTEs) followed by the ground floor (66.1 per 100 FTEs, Table 8). On the first floor the injury incidence rate was 45.0 per 100 FTEs and on the third floor it was 41.2 per 100 FTEs.

The second floor also had the highest rate of assaults (91.4 per 100 FTEs). This was followed by the third floor at 72.9 per 100 FTEs. The ground floor had a rate of 54.1 assaults per 100 FTEs and the first floor had a rate of 47.0 per 100 FTEs.

There was little difference in age between those reporting injuries or assaults in the study period and those who did not report injuries or assaults (Table 9). The injured were on average 2.2 years older than those who did not report injuries. This difference was not significant. Those reporting assaults were only about eight months older, on average, than their coworkers who did not report being assaulted. This difference was also not significant.

The overall injury rate varied little by gender (Table 10). The incidence rate for women was 55.1 per 100 FTEs and for men it was 59.8 per 100 FTEs. The difference in assault rates between men and women, however, was very dramatic. For males the assault rate was 27.2 per 100 FTEs. For females this was 72.3 per 100 FTEs, a 2.7 fold increase.

Certified Nurse Assistants had a higher rate of injuries and assaults (62.9 and 75.3 respectively) than Nurses (38.9 and 46.9 respectively, Table 11).

The incidence rates of injuries and assaults were both highest among full-time facility employees (61.7 per 100 FTEs for injuries, 73.0 per 100 FTEs for assaults, Table 12). The rates dropped for per diem employees (42.0 per 100 FTEs for injuries, 51.7 per 100 FTEs for assaults) and were lowest among pool workers (13.1 per 100 FTEs for injuries, 26.1 per 100 FTEs for assaults).

Injuries were more common on weekends (68.4 per 100 FTEs) than on weekdays (46.9 per 100 FTEs, Table 13). Weekends were defined as beginning on the second shift on Friday afternoon and ending with the start of the first shift on Monday morning. For assaults, the association was reversed. Assaults were reported more often during the week (71.3 per 100 FTEs) than on weekends (44.9 per 100 FTEs).

Injuries and assaults were compared across months of the year. No trends were expected as the population of residents and workers tend to be stable from month to month according to the facility's administrators. The data confirmed no seasonal trend in either injuries or assaults (data not shown).

DISCUSSION

The age and sex distribution of nurses and aides in the study facility was very much as was expected. The median age of nurses was very close to the national median age (Spratley, 2000). The CNAs were younger than the nurses in this facility. It is also widely known that nursing is an occupation populated mostly by women. This was certainly the case in this study population, which was 90% female. The population of CNAs outnumbered nurses by more than two-to-one as is typical in such facilities. In general, CNAs do most of the resident lifting and more menial tasks such as changing clothes and diapers on the residents. They also earn less money than nurses.

The turnover rate among CNAs is known to be high (Cohen-Mansfield, 1997). Turnover in this population was 51%. For nurses it was 35% and for CNAs it was 59%. The difference in tenure between nurses and aides indicated a higher rate of turnover among the aides, as was expected. Also, the distribution of tenure was skewed, suggesting that a small number of long-term employees worked with a fairly fluid group of coworkers who spend a short time employed in this institution. Since pool workers were not employees of the study facility their hire dates were unknown and therefore are not included in the turnover calculations.

Incidence Rates

The overall injury incidence rate of 55.6 per 100 FTEs was lower than was expected. In past research, self-reported back and shoulder injuries alone occurred at nearly this rate (Myers, *et al*, 2002). In the previous study, the outcome was back and shoulder injury regardless of the origin of injury. That is, these injuries were analyzed as one category whether they were the result of an over-exertion during lifting or from being jerked violently by residents during an assault. Even when assaults resulting in harm to the back and shoulder were combined with injuries in this study, and restricted to CNAs (the population studied previously), the incidence rate did not reach that found in the prior study.

This facility had a very high rate of assaults. Arnetz (1998) reported an age and gender standardized rate of 31 assaults per 100 person-years for practical nurses working in a large hospital in Sweden (in that study the practical nurses had the highest assault incidence rate of any job title, which included nurse aides). Although the country is different, it is likely the psychiatric needs of the residents at this facility that explain the high rate of assaults to this worker population.

Injuries and assaults were reported together to the facility's head office. According to administrators, this location had the highest rate of injuries in their chain of long-term care facilities. The unusually high rate of assaults at this facility may be a result of the special needs of this population of residents.

The majority of injuries, as expected, required no treatment. However, over 40% of all reported injuries did. Injuries that fit the BLS definition as those that

"result in lost worktime; require medical treatment (other than first aid); or if the worker experiences loss of consciousness, restriction of work activities or motion, or is transferred to another job" (Bureau of Labor Statistics, 1997, p. 5) occurred at a rate of 17.3 per 100 FTEs. This is 33% higher than the 2001 national rate of 13.0. If injuries due to assaults are included in this category, as they are in the BLS data, the rate at this facility was 23.5 per 100 FTEs, 81% higher than the national rate. The extreme clientele of this facility likely generated the higher than average injury rate. The majority of the excess was probably due to assaults occurring to the staff members by the residents with behavioral problems.

The majority of assaults required no treatment. Only about 13% of reported assaults required at least first aid. This may be misleading however, because the nature of the damage done during an assault might be more difficult to treat with first aid. Many of the assaults were punches, twists and pulls that may have hurt victims a great deal but have no logical first aid treatment available. Degree of physical pain and emotional distress were not recorded in the facility's incident reports, and therefore may not be well represented by the treatment data.

Still, there was a greater risk of a severe injury than of a severe assault. The rate of injuries requiring clinical care was more than twice as high as the rate of assaults requiring clinical care. Emergency room visits occurred for injuries at a rate nearly four times that of those for assaults.

The back and shoulder category had the highest rate of injury at 25.7 per 100 FTEs for CNAs. However, this was expected to be higher that it was. In a previous

study, the self-reported back and shoulder injury rate for nurse aides was over 45 per 100 FTEs (Myers, *et al*, 2002). It may be that this facility has a more mobile population of residents than was found in the previous study that was done in a traditional nursing home. Or perhaps workers at this location used mechanical lifts with greater frequency than did subjects in the previous research. Upper extremities and lower extremities had the next two highest rates of injuries.

The distribution of assaults by body part was very different than that for injuries. The highest rate of assaults was to the upper extremities. This is logical because many of the assaults were due to residents grabbing the hands and arms of the staff members. Also, as workers protect themselves from combative residents their upper extremities are brought into harm's way. It appeared that the head and face were also frequent targets of upset residents.

The most common outcome, or nature, of assaults was "No Injury". This is probably due to the difficulty in treating assaults as was described in the discussion on severity above. The largest category that did result from injury was scratches and abrasions. Contusions made up the next most frequent nature of assault. It is possible that many more injuries resulted in contusions than was reported. Many of those resulting in no injury or requiring no treatment may have been kicks and punches that bruised the assault victims but, were not considered injurious because it was an accepted consequence of working with residents with behavioral problems. It is possible that when a resident's fingernails were involved in an assault, the outcomes were reported as more severe.

The rate of over exertion injuries was 19.8 per 100 FTEs. This is the most frequent form of injury in this population. This was expected as there was a good deal of heavy lifting done in this facility. The next most frequent type was due to being "struck by" objects in the facility. Often this meant being hit by falling residents or residents moving around in wheelchairs. This was understandable since the hallways in this building were quite narrow and constantly filled with residents walking around or sitting in wheelchairs as well as medical carts and laundry containers. This was particularly likely on the first shift when residents are most active.

There were no reported incidences of residents using objects like utensils to attack workers, or of residents throwing objects at the staff members. These types of assaults recorded (being struck by a resident as with a fist or a foot, being grabbed and pulled by the resident, being scratched and being bitten or spat upon) do not appear to have been planned ahead of time. Rather, they may have been result of residents becoming upset or angry very quickly.

Shift was expected to be highly associated with risk of injury and assault. Patient contact is correlated with the demands of lifting and the possibility for interaction with hostile residents. Greatest patient contact occurred during the first shift (7:00AM to 3:30PM) followed by the second (3:00 to 11:30PM) and third (11:00PM to 7:30AM) shifts and the incident rates followed this same gradient.

The rate of assaults and injuries was also expected to vary by floor. Administrators described the first floor as the one containing residents with the

greatest physical ailments and the ground floor as that containing the residents with the greatest behavioral problems. Therefore it was expected that the first and ground floors would have the highest level of injuries and assaults respectively. However, the second floor actually had the highest rate of injuries and assaults. It is possible that the gender disparity between the residents (who are all male) and the staff (who are approximately 90% female) may play a role in this unexpected result. Since the staff is often needed for tasks such as bathing, toileting and dressing, it is possible that some of the residents, all of whom have behavioral or psychological disorders, are uncomfortable having a worker of the opposite gender providing this care. Since the disparity in gender between caregivers and residents is greatest on this floor, it is logical that if such an explanation were true, it would be seen in this part of the study facility.

Injury rates were only slightly higher for men than for women. The difference in reported assaults, however, is very dramatic. The rate for women is more than two and a half times that for men. This could reflect a bias in reporting, if men failed to report the less severe assaults that were reported by women. Women, the data showed, had higher rates of assaults resulting in no treatment, but also in those requiring first aid only and those requiring clinical care. Thus, it may be that men underreport the minor assaults but it is less likely the case that they underreport the more severe injuries due to assault. It seems more probable that women were assaulted more than men regardless of the severity of the assault.

The average age of injured staff members was the same as it was for

uninjured staff members. In addition, the average age of assaulted staff members was the same as it was for those not assaulted in this period. However, these comparisons were severely limited by the relatively small number of people who returned a questionnaire.

Since CNAs generally do more lifting than do the nurses, they were expected to have a higher rate of injuries. This was indeed the case; CNAs had an injury incidence rate about 50% higher than the rate for nurses. CNAs were also expected to have more direct patient contact that would create more opportunities to be assaulted. The assault rate for CNAs was also about 50% higher for CNAs than it is for nurses. Therefore the frequency of contact with upset residents is the suspected explanation for the increase risk of assault among CNAs.

It was thought that those who work for the study site less frequently, the per diem and pool workers, would have a higher rate of injury due to their inexperience and lack of familiarity with their coworkers, the residents and their physical surroundings. This expectation was contradicted in this study population as the relationships between both injuries and assaults dropped rather than increased when moving across the standard employee, per diem and pool worker employment categories (Table 12).

It was expected that injuries and assaults would decline on weekends since staff members reported weekends were quieter periods than the rest of the week. They suggested that residents were calmer as there were fewer administrators and no physicians present. This hypothesis did not hold for injuries, which were reported

more often on weekends than during the week. Assaults, however, did decline on weekends, as expected. This is taken as lending support to the notion that the residents are less aggressive on weekends. No explanation of the increase in injury rates on weekends is offered.

CONCLUSIONS

The results presented here are part of a larger study to examine the role of social networks among healthcare workers and the risk of injury and assault. Here we present a descriptive report of injuries and assaults that occurred among a population of nurses and nurse aides over a sixteen-month period. This facility had an overall self-reported rate of injuries that was lower than reported in a previous study, however, the rate of injuries of the severity required to be reported by the BLS was 86% higher than the national average for nursing and personal care facilities. When injuries due to assaults were included in this calculation, the rate is three times higher than the national average reported for the year 2001.

The fact that injuries tended to occur to backs and shoulders, were mostly sprains and strains, and were often the result of over-exertions indicates that resident lifting was likely a major factor in the production of injuries in this organization. This hypothesis is further supported by the higher rate of injuries that occur on the first shift when there is the greatest amount of resident lifting is done. Any future multivariate analysis of injuries will need to account for lifting demands.

The upper extremities and head and face were the most frequent body parts targeted during assaults as residents intentionally try to hurt the staff members. The abdomen is also a target of assaults yet was never listed as a body part for an injury. Many assaults result in “no injury” when nature is reported, but it is suspected that

some of these are the result of being struck or jerked by a resident and may inflict serious pain but not be amenable to treatment and thus considered not an injury. It is possible, though, that many of these may have been of no consequence and involved only a brush of an arm or a tug on one's clothing. Not surprisingly, the category that occurred frequently that was given a nature code was scratches and abrasions. These results suggest that further analysis of assaults should include some measure of patient contact with the more aggressive residents.

These data also suggest the need to account for resident contact which is likely the real explanatory factor behind these events. In the absence of such a specific measure, analysis of injuries and assaults should at least include shift, job title and employment status variables that are correlated with resident contact. It appears that resident contact has two dangerous dimensions. The lifting of residents is likely related to the rate of injuries faced by nursing staff. The aggressiveness of residents is likely related to the risk of assault.

Finally, when analyzing assaults, the sex of the worker must also be considered. For injuries, it appears that gender is not an important factor. However, women were assaulted more often than men at this facility.

Additional potential research topics to come from this study are the negative association between employment status and risk of both injury and assault and the unexpected elevated risk of injury and assault found on the second floor.

The association with job status was the opposite of what was expected and should be investigated further. It is possible that the standard employees work the

first and second shifts more and that they have greater demands in the form of lifting and other resident contact.

The unexpected elevated risk of injury and assault found on the second floor in this institution suggest that the differences in gender composition of the workers and residents may be a possible component to the explanation. It may be that the male residents pose a greater risk of injury because they are heavier and stronger than female residents. It may also be that the difference in gender from their caregivers is a source of anxiety and makes them more hostile to the staff than female residents are.

The fact that injuries and assaults varied by job status and between week- and weekend days suggests that there may be a social component to the nature of assaults, that is, that the way residents are treated by their caregivers affects their mental status and alters the risk of their becoming combative.

LITERATURE CITED

1. Arnetz. J.E., Bengt, B. and Soderman, E. 1998. Violence Towards Health Care Workers: Prevalence and Incidence at a Large, Regional Hospital in Sweden. AAOHN. 46(3).

2. Bureau of Labor Statistics. 2002. National Census of Occupational Injuries, 2001 Bureau of Labor Statistics News 2002. Washington DC: United States Department of Labor.

3. Cohen-Mansfield J. 1997. Turnover among nursing home staff. Nursing Management 28(5): 59–60, 62, 64.

4. Myers, D., Silverstein B. & Nelson N. 2002. Predictors of shoulder and back injuries in nursing home workers: a prospective study. Amer J Ind Med. 41(6):466-76.

5. National Institute of Occupational Safety and Health. 2001. National Occupational Research Agenda Update. Cincinnati: US Department of Health and Human Services, Public Health Services, Centers for Disease Control and Prevention, National Institute of Occupational Safety and Health. Publication No. 2001-147.

6. NIOSH, 2002. Violence: Occupational Hazards in Hospitals. Cincinnati: US Department of Health and Human Services, Public Health Services, Centers for Disease Control and Prevention, National Institute of Occupational Safety and Health. Publication No. 2002-101.

7. Spratley, E. 2000. The Registered Nurse Population, Findings from the National Sample Survey of Registered Nurses, U.S. Department of Health & Human Services, Bureau of Health Professions, Division of Nursing, Health Resources and Services Administration.

8. United States Department of Labor. Bureau of Labor Statistics 2002. "National Census of Occupational Injuries, 2001" BLS News 2002. Washington DC: United States Department of Labor.

9. United States Department of Labor. Bureau of Labor Statistics. 1997. Occupational injuries and illnesses: Counts, rates, and characteristics, 1994. Bulletin 2485.

TABLES

Table 1.

Population Demographics (Age and Sex, Job Title, Employment Status, Tenure)

Population Demographics	All	N	Nurse	N	CNAs	N
Age in Years (Median)	34	92	44	22	30.5	70
Sex						
Female	88.9%	302	93.1%	102	87.1%	233
Male	11.1%	37	6.9%	7	12.9%	30
Job Title (% Total)						
CNA	69.5	233	--	--	--	--
Nurse	30.5	102	--	--	--	--
Employment Status (% in each category)						
Standard Employee	55.9	185	43.1	44	61.6	141
Per Diem	19.3	64	23.5	24	17.5	40
Pool Agency Employee	24.8	82	33.3	34	21.5	48
Tenure in Years (Median)						
	1.3	225	2.7	65	1.2	160
Turnover (%)						
	51.4	--	34.9	--	58.8	--

Table 2.

Injury and Assault Incidence Rate and Cumulative Incidence

	Total	Incidence Rate	Cumulative Incidence
Injuries	90	56.2	0.40
Assaults	109	66.7	0.47

Table 3.

Injuries and Assaults by Severity

	Injuries		Assaults	
Severity	Number	Incidence Rate	Number	Incidence Rate
No Treatment	41	25.5	69	42.9
First Aid Only	9	5.6	12	7.5
Refer to Clinic	13	8.0	6	3.7
ER	15	9.3	4	2.5
Total	78		91	

Table 4.

Injuries and Assaults by Body Part

	Injuries		Assaults	
Body Part	**Number**	**Incidence Rate**	**Number**	**Incidence Rate**
Abdomen	0	0.0	17	10.5
Back/Shoulder	34	21.0	7	4.3
Head/Face	7	4.3	31	19.1
Lower Ext.	21	13.0	5	3.1
Upper Ext.	28	17.3	49	30.4
Total	90		109	

Table 5.

Injuries and Assaults by Nature of Event

	Injuries		Assaults	
		Incidence		Incidence
Nature	**Number**	**Rate**	**Number**	**Rate**
No Injury	0	0.0	39	24.1
Burn	2	1.2	0	0.0
Contusion	18	11.1	10	6.2
Exposure	4	2.5	9	5.6
Fracture	1	0.6	0	0.0
Joint Inflammation	1	0.6	0	0.0
Laceration/Puncture	11	6.8	4	2.5
Scratch/Abrasion	2	1.2	23	14.2
Sprain/Strain	50	30.9	5	3.1
Total	89		90	

Table 6.
Injuries and Assaults by Type

Injuries

Type	Number	Incidence Rate
Bodily Reaction	6	3.7
Caught In	1	0.6
Fall - Same Level	11	6.8
Over Exertion	32	19.8
Rubbed/Abraded	5	3.1
Struck Against	10	6.2
Struck By	22	13.6
Total	87	

Assaults

Type	Number	Incidence Rate
Bite	4	2.5
Punch/Kick/Strike	54	33.4
Puncture	1	0.6
Scratch	21	13.0
Spit	5	3.1
Squeeze/Twist/Pull	13	8.0
Total	98	

Table 7.

Incidence Rate by Shift

	Injuries		Assaults	
Shift	**Number**	**Incidence Rate**	**Number**	**Incidence Rate**
First	53	76.9	60	87.1
Second	30	47.8	40	63.8
Third	7	23.1	9	29.7
Total	90	56.2	109	66.7

Table 8.

Injury and Assault Incidence Rates by Floor

	Injuries		Assaults	
Floor	Number	Incidence Rate	Number	Incidence Rate
Ground	20	60.1	16	48.1
First	20	39.1	23	45.0
Second	33	71.8	41	89.3
Third	13	41.2	23	72.9
Total	86		103	

Table 9.

Average Age by Injury and Assault Status

	Average	S.D.	N
Injured	40.1	11.2	57
Not Injured	33.3	11.5	32
Assaulted	36.7	12.8	40
Not Assaulted	35.5	10.8	49

Table 10.

Injury and Assault Incidence Rates by Gender

	Injuries		Assaults	
Gender	**Number**	**Incidence Rate**	**Number**	**Incidence Rate**
Females	79	55.1	104	72.3
Males	11	59.8	5	27.2
Total	90		109	

Table 11.

Injury and Assault Incidence Rates by Job Title

		Injuries		Assaults	
Job Title	FTEs	Number	Incidence Rate	Number	Incidence Rate
CNAs	112.9	71	62.9	85	75.3
Nurses	49.0	19	38.9	23	46.9
Total	161.9	90		108	

Table 12.

Injury and Assault Rates by Employment Status

Employment Status	FTEs	Injuries		Assaults	
		Number	Incidence Rate	Number	Incidence Rate
Full-Time	123.2	76	61.7	90	73.0
Per Diem	31.0	13	42.0	16	51.7
Pool Worker	7.7	1	13.1	2	26.1
Total	161.9	90	56.2	108	66.7

Table 13.

Injury and Assault Incidence Rate by Weekday and Weekend Shifts

Injuries	Total	Incidence Rate
Weekday	54	46.9
Weekend*	32	68.4
Assaults	**Total**	**Incidence Rate**
Weekday	82	71.3
Weekend*	21	44.9

*Second shift on Friday through third shift on Sunday.

CHAPTER III.
SOCIAL NETWORK MEASURES AND RISK OF INJURY AND ASSAULT

BACKGROUND

In the field of sociology, studies demonstrating the importance of social relations among workers go back at least as far as the Hawthorne experimental studies of the 1930's (Roethlisberger and Dickson, 1939). Unfortunately, these groundbreaking studies of social interactions among workers are usually only remembered for demonstrating the impact of investigator observation on the phenomenon being studied. Less familiar are the details of the social divisions that occurred in the workgroup and the corresponding privileges and statuses awarded to members of each subgroup.

Methodological advances during the 1970s and 1980s have led to exponential growth in the range of application of social network analytic techniques (sociometrics) (Wasserman and Galaskiewicz, 1994). Many other studies have since used sociometrics to demonstrate the effect of workgroup social relations on a variety of outcomes including attitudes (Burt, 1982, Rentsch, 1990), job satisfaction (Iberra and Andrews, 1993), turnover (Krackhardt and Porter, 1986, Price and Mueller, 1986), burnout (Anderson, 1991), and absenteeism (Krackhardt and Kilduff, 1990). In a well-known study of social contagion, Kerckhoff and Back partly attributed the spread of physiologically unexplainable illness among Montana mill workers to

patterns of social contact with coworkers (Kerckhoff and Back, 1968). However, very little epidemiologic research has used these techniques and the social network approach to investigate the potential impact of workplace social relations on the risk of work-related injuries (Veazie, 1994).

Social Factors in Epidemiology

The prevention of occupational injuries has largely been viewed as either a technical problem, or one requiring changes in individual behavior (Shannon, *et al*, 1996). The relatively stable national occupational injury rate between 1981 and 1994 suggests that, if further improvements are to be made, new approaches may be needed to identify factors to target for intervention. Several authors have noted that the social environment has been under-studied as a potential source of prevention strategies (Diez-Roux 1998; Link and Phelan 1995; Shy 1997; Veazie 1994). Nearly forty years ago Cassel (1964) argued that an epidemiologist ought to look to the social sciences for a "new or modified model of disease causation." More recently, Shy and Diez-Roux have made similar arguments, calling for a broadening of the field of epidemiology to include social science perspectives and for more attention to the social context and the "human variables" in epidemiologic research (Diez-Roux 1998; Shy 1997).

Link and Phelan (1995) noted that, in epidemiology, social conditions have received less attention than the more proximal "causes" of diseases. They used existing epidemiologic literature to illustrate their conception of social conditions as "fundamental causes" of health outcomes. According to their view, access to certain

resources plays an important role in the risk of a variety of health outcomes. They argued that some resources "help individuals avoid diseases and their negative consequences through a variety of mechanisms." Among their list of important resources are knowledge, prestige and "social connectedness."

Link and Phelan defined social conditions as "factors that involve a person's relationships to other people. These include everything from relationships with intimates to positions occupied within the social and economic structures of society" (Link and Phelan, 1995). The emphasis on social relations makes this definition of social conditions strongly resemble the concept of "social position" as used in social network analysis (Burt, 1991).

In addition, the examination of the role of work organization issues in occupational injury etiology has been identified as a NORA research priority (NIOSH, 1999). The informal social relations among workers are the element of work organization that will be investigated in this study. Social network analytic concepts and methods were used to quantitatively characterize social conditions in the workplace so that their role in the incidence of workplace injuries could be explored.

Social Networks

A social network consists of individuals and the relationships among them. Within a social network, there are social "positions" (also referred to as "locations"), which members occupy. Social positions in the group are conceived of as the intersecting pattern of relations one has with the other group members (Burt, 1991).

Since social position in a workgroup describes the way one relates to coworkers, position is considered a measure of the social context of the worker. Important elements of the social context include access to resources, control over resources, social prestige and social support (Link and Phelan, 1995).

This study uses this perspective to explore the role of social conditions in the risk of acute workplace injuries. While the transfer of energy is recognized to be the proximate "cause" of workplace injuries (Hagberg, *et al*, 1997), social conditions in the workplace are hypothesized to serve as proximal causes of injuries by modifying workers' exposures.

Specifically, resources such as physical assistance and social support from friends are hypothesized to modify the risk of injury in the workplace. These resources represent the two fundamental kinds of relations that are studied by social network analysis: instrumental relations and emotive relations (Wasserman and Faust, 1994). Instrumental relations involve the flow of goods or impersonal services such as money or information. Emotive relations are highly personal and indicate the flow of things like trust and friendship (Ibarra and Andrews, 1993).

Objectives and Hypotheses

In the second chapter of this dissertation, it was shown that injuries and assaults varied by shift, floor, job title and job status. Assaults also varied by the gender of the staff members. It was expected that the inclusion of resident contact in the form of resident lifting and residents' hostility level would explain the variance in injury and assault rates, respectively, by floor, shift and job title.

In this study the social position of nurses and certified nursing assistants (CNAs) was explored as a potential modifier in the risk of workplace injury and assault already quantified. It was hypothesized that having more ties to coworkers would lower the risk of injuries and assaults. Greater "connectedness" to other coworkers was seen as a resource that would provide safety in the form of physical assistance, information and concern from fellow coworkers.

It was hypothesized that working with familiar coworkers means that one knows the routines of others and that they can better coordinate their actions than if they were working with others unfamiliar to them. This hypothesis was rooted in the sociological work of Peter Blau who claimed that repeated interactions between individuals leads to greater cohesion among group members (Blau, 1960). Similarly, Simmel (1956) stated that repeated interactions lead to greater likelihood of agreements among individuals and Gouldner (1960) theorized that greater reciprocity occurs among individuals who have had repeated interactions over time. The more individuals interacted with other group members, the greater the extent to which they became part of the group and were subject to its norms and expectations. This perspective was adapted to this study to support the notion that repeated interactions between coworkers indicated a greater connectedness to the group. This greater connectedness to the group was hypothesized to be protective of injuries and assaults as connected individuals have access to protective resources described above.

METHODOLOGY

This was a 16-month cohort study of nurses and nurse aides working in a dual diagnosis long-term care facility. Twelve months of data were collected prospectively and combined with retrospective data for the preceding four months. The population of residents cared for in this facility was unusual in that all had psychiatric conditions that led them to be placed in this infirmary. (See paper 1 of this dissertation for a detailed description of the study setting.)

Study Setting and Population

Any nurse or aide who worked at least one shift on a date on which an injury or assault occurred, regardless of whether she/he was employed by the institution or an outside agency, was included in the study. This dynamic cohort of 339 Nurses and CNAs was followed for sixteen months. The person-time from which all injury and assaults are drawn in the sixteen-month period was approximately 162 full-time equivalent person-years (defined below).

Supervisors were not included in these analyses. The nature of work for supervisors in this institution tended be highly managerial in nature. They worked mostly on the first shift and had a variety of duties and responsibilities. They were not assigned to any given floor and were not deemed part of any workgroup (defined below). Also eliminated from this study are administrators as well as clerical, housekeeping, maintenance, kitchen employees and visiting physicians.

Data Sources

Administrative Records. The shift schedule records consisted of attendance data for all nurses and aides. The schedule was organized by job title, floor, shift, and date for each two-week period. These data provided a record of who was working on each floor and shift for every date of the study period. This was the primary source of work records and was used to fill in job title and employment status missing from the roster and survey data (see below). Missing date of hire could sometimes be estimated using this source as well. When hire date was missing from the roster data and the first few shifts that are reported for a given worker are designated as "Orientation," the date of hire was estimated as two days prior to the first recorded shift. These records were generated and maintained by two Schedule Coordinators at the facility.

There was at least one injury or assault approximately every three days in this facility. Because of multiple injuries and/or assaults or a combination of the two there was on average an event every 2.4 days, or every 57.6 hours of operation. Only dates on which an injury or assault occurred were entered for analysis. This was done to save the time of entering the estimated forty-plus thousand person-shift observations worked during the sixteen-month study period. The data entered comprise 12,407 person-shifts.

Employee rosters available from the institution's national headquarters provided a cross-section listing of all workers present on a given day. Three times during the study period employee rosters were gathered, although the data were in

different formats and did not always contain the same data. For example, on two rosters, hire dates were provided. On a third roster, instead of date of hire, "years of experience" was listed. Rosters were used to make data entry efficient. Rather than entering job title for every person-shift, variables such as job title were merged onto the shift data. Date was considered when the data were merged so that the roster data would be as accurate as possible. Rosters often did not include employees of very short duration and did not include any information for those who worked at external agencies. These rosters were supplemented whenever possible with the shift schedule data.

Standardized Questionnaires. Surveys designed specifically for this study were administered twice. The first survey contained 82 items including demographic items, physical exposure data, the standard 49-question version of the Job Content Questionnaire (Karasek, 1985) and the social network questions. Fifty individuals completed this survey administered in early July, 2001. In an attempt to obtain data on more subjects a second shorter survey was administered in October, 2001. This survey had only 16 items covering the social network domain, some physical exposures and demographics. Seventy-seven individuals filled out the short survey. After removing ineligible responders (supervisors, maintenance and clerical workers) survey data were utilized for 94 individuals. Twenty-one individuals filled out both surveys and for these individuals the few duplicate items were assigned to the closer dates worked during the study period. Survey data were available (at least one

survey) for 56 of the 90 (62%) reported injuries and 69 of the 109 (63%) reported assaults.

There were three employment status categories in this workforce: standard employees (57%, N=187), per diem (19%, N=62) and pool workers (24%, N=80). "Standard employees" were workers fully associated with the institution. Per diem employees were paid directly by the institution but they worked on a call-in basis. Per diem employees earned a %15 premium in pay compared to standard employees but they received no health coverage or other benefits. Pool workers were nurses and CNAs who were employed and paid by an external agency but who provided coverage for the study institution on a call-in basis.

The institution's Medical Records Administrator maintained a file of all injuries and assaults reported by all employees. These data were documented events and provide the name and employment status of the individual. Included were the date, location, time, shift on which the event occurred. In addition, the incident reports provided type, result, body part, treatment provided and a short prose description of the event.

Injuries in this study included all events that were reported by nurses or aides as having occurred as a result of actions not involving abusive behavior by the residents. Assaults were all events in which a staff member reported some kind of abuse by residents and could include events in which no noted physical harm was done. Only the self-reporting of an event was required for inclusion.

Event descriptions were examined for each incident reported in the study period by nurses and aides. Based on these descriptions, three of the events were discarded (a theft of property in a staff member's car, an infection—deemed a disease and not an injury *per se*—and a time in which at least one person was stuck in an elevator). The description of the events was used to confirm the type of incident (injury or assault). Thus, one hundred ninety-nine events were included in the study. Ninety were non-assault injuries and 109 were assaults.

To represent incidence rates, a denominator of full-time equivalent (FTE) employees was used. This was calculated as the number of person-shifts in a given category divided by 250 to represent the number of shifts worked in a standard work year. The total amount of person-time was estimated to be approximately 161.9 full-time equivalent person-years. (For a detailed description of the estimate of person-time see Chapter 2 of this dissertation.)

Physical Exposures

The average daily lifting of residents during transfers was the measure of physical demands used in this study. For each of the four floors, one first shift CNA who was familiar with all residents on her respective floor went resident by resident with the researcher and estimated the number of lifts each resident required on an average day. These informants were prompted to consider all transfers to and from all chairs and beds for all activities including feeding, showering, toileting, recreational activities and smoking. These scores of individual residents' lifting

demands were summed to provide a floor level estimate of the number of lifts required of the Nurse and CNA staff members on an average day.

Two other aides who were familiar with working all shifts were together asked to estimate the proportion of lifting that typically occurred on the second and third shifts compared to the first. They considered how the standard activities including meals, showering, and recreational activities varied by shift. They estimated that the second shift typically had between 25-50% of the lifting duties that are required of the first shift staff. Therefore a multiplier of 0.375 was used to estimate the fraction of lifting done on the second shift compared to the first. The only routine lifting done on the third shift occurs at the end of their shift. During the half hour overlap with the first shift staff, third shift staff members assist the first shift with getting residents up for breakfast. They also handle residents who occasionally need to get out of their beds at night. Therefore a multiplier of 0.15 was assigned to the floor level measure of physical lifting.

Aides were also asked to determine how much of the lifting reported was done by aides and how much was done by nurses. They reported that all routine lifting was done by the CNAs. However, since it is known that lifting of patients is an exposure among nurses in general (Owen and Garg, 1994), and since the researcher witnessed nurses lifting residents off the floor and restraining combative residents on more than one occasion, a multiplier of 0.2 was applied to the floor level measure of lifting as an estimate of the amount of lifting nurses perform.

The CNAs who provided data on the physical demands also provided estimates of the frequency of aggressive actions made by the each resident on an average day. The individual residents' scores were summed to provide a floor level measure of the typical degree of combativeness among the residents faced by the staff.

The information used to create the weighting scheme to adjust resident lifting by shift was considered a proxy for patient contact. Therefore, the same weights that were applied to account for the variation in resident lifting by shift were also used to adjust the residents' hostility scores by shift. Similarly, the multipliers that were used to adjust for differences in lifting demands between nurses and CNAs were also used to estimate nurses' exposure to resident hostility.

Sociometric Data

In this study, both instrumental relations (helping with physical tasks) and emotive relations (friendships) were measured. Two social networks were measured in this study: the "help network" (representing the provision of physical assistance) and the friendship network (representing social support). Surveys used to gather sociometric data (data used to quantify one's relations with others in a group) were administered twice, approximately three months apart. When subjects completed more than one survey, the one closer to the date of each person-shift was used. In the surveys, subjects were asked to provide names of all nurses, including nurse managers, and aides in the facility they "consider to be friends." They also provided names of anyone they "would ask for help when doing a physical task such as lifting or restraining residents." In raw form these data provide the number of friends or

helpers each subject has among the entire nursing staff. These data were used in conjunction with staffing records to measure the ties each worker had with their coworkers on each shift.

A *workgroup* was defined as all nurses and aides working on any given floor and shift for the eight-hour work-shift. Workgroups are dynamic since individuals do not work every day and may work on different floors or shifts from day to day. For every person-shift sampled, the lists of friends and helpers recorded in the surveys were matched with the names of coworkers in each subject's workgroup. That is, from a subject's complete list of friends or helpers, those who appear in each of the subjects' workgroups were identified. The number of friends and helpers in each workgroup were tallied for each person-shift. The number of ties one has to others is called outdegree centrality (Wasserman and Faust, 1994). In this study the outdegree centrality of ties to friends and helpers were used to measure the "connectedness" of each staff member to her or his coworkers for every shift in the sample. The number of friends or helpers in each subject's workgroup was divided by the number of coworkers in the group (minus one to account for the subject) to produce a measure that was standardized by the workgroup's size.

Thus two social network scores were obtained in this study using survey questionnaires. One reflects the number of friends and helpers throughout the entire facility. For this there was one record per person who filled out at least one survey. The other is a measure of friends and helpers with whom a person is working in their workgroup. For this, there was one record per person-shift.

Those who claimed that "all" were friends or helpers were given scores of the workgroup size minus one (subtracting the subject from the workgroup) times 0.8. This was done under the assumption that these subjects did not actually consider all coworkers friends or helpers, or that at least these subjects did not view all coworkers as friends or helpers with equal devotion.

"Regular" Staff Members

In addition to using social relations data gathered in surveys, staffing records were used to measure each subject's integration with coworkers. A variable was created to indicate when a worker was assigned, for a given person-shift, to a floor and shift familiar to her or him. The purpose of this was to estimate the social position of the worker using routinely collected data. A subject was considered a regular after repeatedly working in the same workgroup *and* while currently working in that workgroup (on a given shift). The "regular" variable was created using only staffing records and was generated for nearly[a] all person-shift observations. A nurse or CNA was deemed a regular in a given observation if s/he worked on the same floor and shift on five of the past seven times they showed up in the sample of person-time. The denominator of seven was chosen because, on average, there were sixty days between *any* seven (within-person) observations in the study. Thus, the period during which a worker may be deemed a regular is on average, sixty days. This window was

[a] For those nurses and aides hired before the start of the study period, the first sixty days of the study period serve as a blackout period during which their status as regulars is unknown and recorded as missing. For those hired after the start of the study period, the first seven dates are defined as non-regular.

shorter for those who work more often and longer for those who worked less often. Five was chosen as the numerator to allow for the movement of workers from one group to another, as was commonly done in this facility, while still identifying the workgroup in which the subject typically worked.

Therefore, those not deemed “regular” were those who were too new to be familiar with a particular workgroup, who frequently worked in different workgroups, or who were working on a floor or shift with workgroup that was not comprised of their usual coworkers. In addition, a person could be a non-regular if that person worked so infrequently as to not have fit the criteria for being a regular.

Statistical Analyses

Conditional logistic regression was used to analyze the data. This was done because the work records data were entered only for dates on which an injury or assault occurred. Thus the data were matched on date. No other matching was done.

The unit of analysis for all regression models was the person-shift. To analyze the occurrence of injuries and assaults, a score of one was assigned to a person-shift on which an injury or assault was reported. All other person-shifts were scored as zeros for both the injury and assault variables.

A non-parametric smoothing of the risk of injury versus the number of lifts per shift showed a curvilinear relationship. The risk of injury increased monotonically but a plateau effect was observed at the upper range of the lifting exposure. A log-transformation of the lifts per shift variable revealed a very straight

and monotonic association in the non-parametric smoothing plot. Therefore, the log-transformed of the lifts per shift variable was used in the regression modeling.

A nearly identical curvilinear association was found between average daily number of combative events and risk of assault. The residents' combativeness score, therefore, was analyzed in its log-transformed form.

Having been injured or assaulted previously was thought to be a possible predictor of future injury or assault. To examine this, dummy variables were created to indicate whether or not the subject had reported at least one injury or at least on assault during the study period prior to the current person-shift.

RESULTS

Among the 339 individuals who worked at least one day on which an injury or assault occurred, 233 were CNAs and 102 were nurses (4 missing job title). The nurses category included all Registered Nurses and Licensed Practical Nurses and individuals labeled "Medical Nurse." The CNA category includes Psychological Certified Nurse Aides, Restorative Aides in addition to standard CNAs. Age data were gathered by survey only (N=92). The median age was 34 years. Nurses ranged from 25 to 59 years of age and had a median age of 44. CNAs ranged from 18 to 60 years and had a median age of 31. Nurses were significantly older than CNAs ($t = 2.16$, $p = 0.03$). Eighty-nine percent of the population was female (N=298). For a detailed description of the demographic information of the staff, see Chapter 2.

Physical Exposure

Floors 3 and 1 required the greatest physical effort by the staff with an estimated 83 and 79 lifts performed on the first shift, respectively (Table 14). This was followed by about 55 lifts on the ground floor and 47 on the second floor.

The ground floor had the lowest hostility score in the facility with approximately 8 combative actions expected among all its residents during the first shift. This was followed by the second floor with 20, the first floor with 33 and the third floor with about 45 combative acts taking place on an average day shift. These

two measures of physical exposure were highly correlated at the level of the floor and shift ($r = 0.85$, $n = 12$).

A subset of 28 workers who responded to the long survey was used to conduct a validation of physical exposures. These were individuals who could be identified, using the staff schedule data, as having worked on a particular floor and shift for most (at least 50%) of their person-shifts (see Chapter 4 for a discussion of "primary workgroup members"). These people were selected from among those who completed surveys because they were likely to have their usual floor and shift in mind when indicating physical demands, a floor and shift that corresponds to the physical exposure estimates described above. A correlation matrix of physical exposures measured by surveys and by the method described above was generated (Table 15). These data show a weak to moderate correlation ($r = 0.33$) between the log of lifts per shift and an ordinally measured survey item from the Job Content Questionnaire (Karasek, 1984) that asks respondents to indicate the overall physical effort of their job. A scatterplot of these two variables showed a single outlier. When this observation was removed, the correlation increased ($r = 0.50$). This is considered a moderate correlation between the two variables and suggests a fairly successful validation of the physical exposure variable.

It was expected that injuries would be predicted by the physical demands of the residents, particularly in the form of their lifting requirements. Also expected was that assaults would be predicted by the hostility of the residents. The data supported these expectations (Table 16). The odds ratio for the log of the average number of

lifts done on a shift, when entered alone into a regression model, was 1.4 (95% CI 1.1, 1.7). The log of the average number of combative interactions was also predictive of injuries (OR = 1.3, 95% CI 1.0, 1.5). However, when the two were included in a single model, the predictive power of physical demands remained (OR = 1.7, 95% CI 1.0, 2.9) but residents' combativeness no longer predicted injuries (OR = 0.8, 95% CI 0.5, 1.3).

Similarly, the log of the number of lifts and the log of the number of combative interactions both predicted the occurrence of assaults. Odds ratios for each variable, entered in separate models, were 1.3 and both had identical confidence intervals (when rounded to one decimal point). But as with injuries, when both were entered into a single model, the odds ratio for the log of combative interactions with residents remains but was no longer significant (OR = 1.4, 95% CI 0.8, 2.2). The odds ratio for the log of the number of lifts no longer predicted assaults when controlling for resident combativeness (OR = 1.0, 95% CI 0.6, 1.6).

To show the magnitude of risk due to lifting and resident hostility, their effects were compared using the 85^{th} and 10^{th} percentiles of each exposure distribution. A staff member with an assigned lifting score ranking in the 85^{th} percentile (approximately 55 lifts per shift) had a 4.2 fold increased risk of injury compared to a staff member who had a lifting score in the 10^{th} percentile (approximately 4 lifts per shift), after adjusting for resident combativeness and being a workgroup regular.

A staff member with an assigned resident combativeness score ranking in the 85th percentile (approximately 20 combative events per shift) had a 5.3 fold increased risk of assault compared to a staff member in the 10th percentile (approximately 1.3 events per shift), after adjusting for resident lifting demands and being a workgroup regular.

Friends and Helpers

On average, the subset of participants who responded to the questionnaires reported 5.4 friends and 8.0 helpers throughout the facility (Table 17). However, ten individuals claimed to be friends with all coworkers and thirty-six individuals claimed to approach anyone for help with physical tasks. After removing these individuals, the data showed that on average each respondent worked with 2.3 friends and 3.0 helpers in each workgroup.

The numbers of friends and helpers reported among the surveys were not associated with either injury or assault risks (Table 18). Controlling for residents' lifting demands or combativeness for injuries and assaults respectively did not alter the lack of association. Similar analyses were done in which the number of friends or helpers was standardized by dividing by the size of the workgroup (minus one to account for the subject). The standardized variable represented the fraction of the workgroup identified as friends or helpers. This adjustment produced nearly identical results (data not shown).

The risk of injury was about twice as high for employees who had been injured before (Table 19). This association was somewhat weaker after controlling

for the residents' lifting demands. Similarly, having experienced a previous assault predicted assault risk (OR = 1.8). When controlling for the residents' hostility, the effect was reduced but remained moderately strong.

Injuries and Assaults among Regulars

To evaluate the effects of coworker familiarity on risk independent of self-report the variable "regular" was used because it did not rely on questionnaire responses. Being a "regular" on a floor and shift was strongly positively associated with both injury and assault risks (Table 20). After controlling for lifting demands, the effect of being a regular on risk of injury was reduced (OR = 1.5).

Regulars were also assaulted more frequently than the non-regular staff members (OR = 2.0, 95% CI 1.3, 3.2). Controlling for residents' hostility only slightly changed the elevated risk of being assaulted among workgroup regulars (OR = 1.9, 95% CI 1.2, 3.0). Additionally controlling for previous assaults further reduced the odds ratio but again only slightly (OR = 1.8, 95% CI 1.1, 2.9).

To determine whether the increased risk among workgroup regulars was the result of reporting bias, the analysis was done stratifying on severity of injury or assault (Table 21). The greater the severity of injury, the stronger was the relationship between being a regular and being injured – the reverse of what would be expected through reporting bias. The odds ratio for the most severe injuries was over two and a half times as large as that for all injuries. Controlling for lifting did not change the pattern of rising odds ratios across the range of severity.

The elevated risk of assault found among workgroup regulars was also observed across levels of assault severity, with odds ratios hovering around 2.0. Few assaults required first aid or more treatment, and so as the severity went up, the statistical power was reduced and the confidence intervals became very wide. Controlling for resident hostility did not change these results.

The existence of past injuries or assaults did not change this pattern of results with injury and assault severity (data not shown).

The effect of being a workgroup regular was found to operate primarily among the nurses (Table 22). This was especially true for injuries. When examining nurses only, the odds ratio for being injured among workgroup regulars was 5.9 (95% CI 1.3, 25.8). The confidence interval became very wide because the number of person shifts was small (N = 422) but it did not include the null value. Controlling for lifting and past injuries did not substantially change these results. Among CNAs, the odds ratio for being injured was close to null (OR = 1.3, 95% CI 0.8, 2.3). Controlling for confounders did not change these results.

For assaults, the effect of being a workgroup regular was also stronger among nurses than among CNAs. Among nurses, the risk of assault was 3.4 times higher for workgroup regulars than non-regulars (95% CI 1.1, 10.7). Among CNAs this increase was only half as large (OR = 1.8, 95% CI 1.1, 2.9).

DISCUSSION

This study used staffing and injury data from one long-term healthcare facility to estimate demands on staff and the extent of social networks among staff. In light of sociological theory, it was hypothesized that coworker support, measured as number of friends and helpful coworkers with whom one works, would affect the risk of injury and assault to staff at work. Results generally did not support the original hypotheses. However, another sociological variable, representing working with coworkers one repeatedly works with, was associated with both risk of injury and assault although not in the expected direction.

The sampling strategy used in this paper raises the possibility of bias. Since the dates entered in the study were 3.2 days apart, on average, this was very close to a one-third sample of person-time. While there is always potential for bias in any sample short of 100%, a one-third sample of person-time spanning sixteen months is rather substantial and not likely to have any major biases due to small sample size alone. But despite the substantial size of the sample, the possibility that it was in some way systematically biased should be considered.

It is important to note that most of the data were collected without respect to the sample of person-time used in the regression models used to produce the results. The injury and assault data are a 100% sample. Since all reported incidents were used, there is no bias regarding outcomes. Data used to indicate that individuals

had been previously injured or assaulted during the study period came also from the injury and assault records. Since all of these were collected, the observed associations could not be the result of bias due to the sampling design. Injury and assault severity data also came from the 100% sample of reported injuries and assaults.

Likewise, the lifting and resident hostility data were gathered without respect to the sampling strategy used in this study. Thus, the sampling of person-time did not bias this information. Therefore, the observed associations between physical exposure variables and injuries and assaults is not the product of sampling bias. The social network data were also gathered by surveys from as many employees as possible and all returned surveys were utilized. Error in these scores could not be due to the sampling of personnel records by date. Job status data were gathered from multiple sources, none of which was connected to the sampling strategy used in this study.

It is difficult to see how the observed association between being a regular and either injury or assault could have been generated by the sampling strategy. In the sub-sample who completed the short questionnaires, over ninety-four percent of those who were counted as regulars for at least fifty percent of their person shifts (indicating that most of the time they were workgroup regulars) reported that they usually worked on the same floor and shift. On the other hand, nearly seventy percent of those not identified as being a regular workgroup member for the majority of their person-shifts in the sample claimed to usually work on the same floor and

shift. It was believed that many staff members who did not complete the short survey questionnaire were likely either per diem employees or pool agency workers who do not work often and were missed simply because they were not, by chance, working on days when surveys were administered. If these workers were surveyed, the majority would likely be identified as non-regulars and they would not claim to work the same floor and shift since they are more often assigned to floors and shifts on an as needed basis than are standard full-time employees. The agreement between being identified as a non-regular and claiming to *not* work on the same floor and shift would be higher than 70% if survey response was more complete.

Originally the study design called for three rounds of surveys over a one-year period. This was done with the social network data in mind. Social network data were to be measured in the middle of each of three four-month periods and assigned to that period only. Circumstances at the study facility and the data collection demands resulted in an amended design with these data gathered twice at intervals four months apart. These data were applied to the entire study period. Over time, ties could be formed and broken, especially as turnover occurs among the staff. As a result, there is likely significant misclassification of the number of friends and helpers one has in a workgroup, and who they are. We have no way to assess whether this could have been differential with regard to injury occurrence. Remedies for this problem are discussed at length in the following paper.

The lack of association between the social network data and injury and assault may have been the result of a poor questionnaire response rate and the employee

turnover that occurred in this population. Less than one-third of all employees who appear in the study completed at least one questionnaire, and turnover was approximately 50%. These three factors greatly affected the power available for the analyses involving social networks.

The fact that residents' lifting demands predicted injuries suggests that lifting exposure as measured in this study was an adequate means of accounting for lifting demands at the group level. Likewise, the fact that residents' aggressive behavior predicts assaults when controlling for their lifting requirements shows that the average expected number of aggressive acts by the residents is an adequate means of accounting for this exposure. It is worth noting that either of these demands, lifting or aggressiveness by themselves, can predict injuries or assaults when not controlling for the other. This is largely because they are highly correlated. However, the fact that these exposures predict the expected outcome when controlling for each other suggests a theoretical validity to the measure of lifting requirements and aggressiveness. These results confirmed that the residents' lifting requirements and hostility were two different aspects of patient contact and contributed to injuries and assaults, respectively, as was expected.

We observed that those who had experienced a prior injury during the study period were more likely to experience a second injury (Table 19). There are several possible explanations for this. It may be that some individuals are injury-prone individuals. This is seen as unlikely since there was also an association between being assaulted before and risk of assault. It is harder to believe that some individuals

are more “assault-prone” than others. Second, it may be that these individuals who are injured or assaulted repeatedly have constantly higher exposures over time. In this case, measuring the physical exposures at the individual level would make the observed associations disappear when controlling for these exposures. Finally, this association might also be explained by individuals putting themselves in harm’s way. In this case, it would not be that the individuals who are injured repeatedly are assigned to more dangerous residents but that they engage in greater risk taking by taking a disproportionate share of the work burden.

The fact that workgroup regulars are more likely to be injured and assaulted than are the non-regulars suggests a difference in risk by social categories. Those who appeared repeatedly in the same workgroup (floor and shift) should have attained some degree of familiarity with the behaviors of coworkers who also work the same floor and shift repeatedly. These behaviors may include work habits such as ways of lifting or interacting with residents. In addition, those who worked together repeatedly would likely have developed and agreed upon norms, values and expectations of fellow coworkers and supervisors.

The association found is not that which was predicted but the fact remains that risk differs by our definition of social subgroups in this workplace. This difference in risk might be explained in many ways. One possibility is that regulars were expected to do more lifting than the non-regulars. When the “regulars” variable was created, it was done with the notion that those who become workgroup regulars are subjected to the norms and rules of the group in ways that non-regulars are not. That is,

workgroup regulars, by virtue of their repeated interactions with group members, are pulled into the identity of the group to a greater degree than those who are not regulars. It is possible that, in order to express their dedication to the care of the residents, the regulars are expected to do more of the patient contact than those who are not regular to the workgroup.

Another possibility is that the regulars form a stronger attachment to the residents than the non-regulars. This possibility was examined. One item included on the longer survey provides a measure of emotional attachment to the residents (on a five point scale). Greater attachment to the residents positively predicted risk of injury but this subset was very small and the estimate lacked precision. When including this variable in a regression model the effect of being a regular was unchanged among this subset of individuals who answered this question on the first survey (data not shown). This suggests that it is not likely a greater dedication to the residents that is responsible for the increased risk in injury among workgroup regulars.

A further possible explanation for the clustering of injuries and assaults among workgroup regulars is a result of a reporting bias. It could be that workers who are not workgroup regulars feel less secure with their positions in the workplace than do their workgroup regular counterparts. This may lead to greater fear of repercussions for reporting injuries or assaults. One would expect that such a reporting bias would be less common among the more severe injuries and assaults. That is, if these outcomes required first aid or more, they were not as likely to be

under-reported as outcomes of a less severe nature. If it were the case that reporting bias was generating the difference in risk between regulars and non-regulars, then these associations would lessen or disappear when looking at the more severe injuries and assaults. This was not the case, as was shown in Table 21. The association between injuries and being a regular increased as the more severe outcomes were examined. The confidence intervals became very wide due to the elimination of the less severe injury outcomes but the odds ratios increased steadily. For assaults, the odds ratios did not increase but they remained constant across severity of assaults. The simple fact that they did not decrease across assault severity category suggests reporting bias was not likely the explanatory factor behind the association between being injured or assaulted and being a regular workgroup member.

An unexpected interaction in risk of injury and assault was found between job title and being a regular. The increase in risk among regulars existed almost entirely among the nurses (see Table 22). When stratifying by job title, the excess risk of being injured or assaulted among regulars was seen only among the nurses. This association was very strong and was only slightly lessened when controlling for lifting (for injuries) or resident's aggressiveness (for assaults) and being previously injured or assaulted. These results suggest a possible difference in relations between regular and non-regular workgroup members among the nurses that is not found among CNAs. It is possible that the need to display to one's coworkers one's devotion to caring for the residents exists only among the nurses.

This stratification by job title also revealed an interaction between physical demands and job title. The lifting demands did not predict injuries among nurses as it did among CNAs. Nor did the residents' hostility predict the risk of assault to nurses as it did among CNAs. Since patient/resident handling is known to be a major contributing factor to the high injury rates among healthcare workers (Garg and Owen, 1994) these findings may reflect an insufficient measurement of these exposures among nurses. Another possibility is that the kinds of injuries that nurses experience in this facility are not related to these exposures.

Finally, these unexpected findings may be the result of chance. It may be that the excess risk of injury and assault found among regular workgroup members is an anomaly of this workplace and this time period. This study was not very large and these results might have been different if the study period was stretched for several years or if multiple facilities were studied.

CONCLUSIONS

These analyses have revealed several potentially important patterns in the distribution of injuries and assaults among the staff of a long term care facility. First, the frequency of patient lifting was found to be an important predictor of injuries. This risk was primarily observed among the CNAs, who do the bulk of the lifting according to staff interviews. Second, hostile behavior by the residents was a predictor of assaults. This too was primarily observed among the CNA staff. Third, workgroup regulars were found to have a greater risk of both injury and assault than those who are not workgroup regulars. This difference in risk existed only among the nurses. This was not what was expected, but we theorize that this finding reflects a difference in physical demands the regular workgroup nurses take upon themselves as a result of the expectations of their regular workgroup coworkers. The culture of professionalism and their view of their jobs as caring for the residents may be driving the highly integrated nurses to put greater workloads upon themselves and put themselves at higher risk of injury and assault.

LITERATURE CITED

1. Blau, P.M. 1960. A Theory of Social Integration. Amer J of Sociology, Vol. 65, No. 6 (May), pp. 545-556

2. Burt, R.S. 1991. Structure version 4.2 reference manual. New York: Columbia University.

3. Burt, R.S. 1982. Toward a structural theory of action. New York: Academic Press.

4. Cassel, J. 1964. Social science theory as a source of hypotheses in epidemiological research. American Journal of Public Health, 54(9), 1482-88.

5. Diez-Roux, A.V. 1998. Bringing context back into epidemiology: Variables and fallacies in multilevel analysis. American Journal of Public Health, 88(2), 216-22.

6. Garg A, Owen B. 1994: An ergonomic approach to preventing back injuries from patient lifting. PTSM Series 2:15-22.

7. Gouldner, A. 1960. The Norm of Reciprocity. Amer Sociological Rev. 25:161-178.

8. Hagberg, M., Christiani, D., Courtney, T.K., Halperin, W., Leamon, T.B., & Smith, TJ. 1997. Conceptual and definitional issues in occupational injury epidemiology. American Journal of Industrial Medicine, 32, 106-115.

9. Ibarra, H., & Andrews, S. 1993. Power, social influence, and sense making: Effects of network centrality and proximity on employee perceptions. Administrative Science Quarterly, 38, 277-303.

10. Karasek, R., Pieper, C. and Schwartz, J. 1985. Job Content Questionnaire and User's Guide. Revision 1.1. Developed at Columbia University. Information from Dr. Karasek, Dept. of Work Environment, UMass./Lowell, MA.

11. Kerchoff, A.C., & Back, K.W. 1968. The June bug: Study of hysterical contagion. New York: Appleton-Century-Croft.

12. Krackhardt, D., & Porter, L.W. 1986. The snowball effect: Turnover embedded in communication networks. Journal of Applied Psychology, 71, 50-55.

13. Link, B.G. and J.C. Phelan. 1995. Social conditions as fundamental causes of disease. Journal of Health and Social Behavior extra issue: 80-94.

14. NIOSH 1999. National Occupational Research Agenda Update: 21 Priorities for the 21st Century. Cincinnati: US Department of Health and Human Services, Public Health Services, Centers for Disease Control and Prevention, National Institute of Occupational Safety and Health. Publication No. 99-124.

15. Price, J.L., & Mueller, CW. 1986. Absenteeism and turnover of hospital employees. Connecticut: JAI Press, Inc.

16. Rentsch, J.R. 1990 Climate and culture: Interaction and qualitative differences in organizational meanings. Journal of Applied Psychology, 75, 668-681.

17. Roethlisberger, F.J., & Dickson, W.J. 1939. Management and the worker. Cambridge: Harvard University Press.

18. Shannon, H.S., Walters, V., Lewchuck, W., Richardson, J, Moran, L.A., Haines, T., & Verma, D. 1996. Workplace organizational correlates of lost-time accident rates in manufacturing. American Journal of Industrial Medicine. 29(3), 258-68.

19. Shy, C.M. 1997. The failure of academic epidemiology: Witness for the prosecution. American Journal of Epidemiology, 145, 479-84.

20. Simmel G. 1950. The Sociology of Georg Simmel, translated and edited by Kurt H. Wolff, Glencoe. Ill.: Free Press.

21. Veazie, M.A., Landen, D.D., Bender, T.R., & Amandus, H.E. 1994. Epidemiologic research on the etiology of injuries at work. Annual Review of Public Health, 15, 203-21.

22. Wasserman, S., & Galaskiewicz, J. (Eds.). 1994. Advances in social network analysis: Research in the social and behavioral sciences. California: Sage Publications.

23. Wasserman, S., & Faust, K. 1994. Social network analysis: Methods and applications. New York: Cambridge University Press.

TABLES

Table 14.

Descriptive Statistics of Resident Lifting and Resident Hostility

Average Number of Lifts Per Shift

	Shift			
Floor	**1**	**2**	**3**	**Total**
0	54.5	20.4	8.2	83.1
1	83.0	31.1	12.5	126.6
2	46.5	17.4	7.0	70.9
3	79.0	29.6	11.9	120.5
Total	263.0	98.5	39.6	401.1

Average Expected Combative Events Per Shift

	Shift			
Floor	**1**	**2**	**3**	**Total**
0	8.0	3.0	1.2	12.2
1	33.0	12.4	5.0	50.4
2	20.0	7.5	3.0	30.5
3	44.5	16.7	6.7	67.9
Total	105.5	39.6	15.9	161

Table 15.
Correlations Among Physical Exposures Measured by Surveys and Interviews

n = 28*	1	2	3	4	5
1. Log of Lifts per Shift					
2. Log of Resident Combativeness	0.89				
3. Physical Effort (Survey--JCQ)	0.33**	0.27			
4. Overall Effort (Survey not JCQ)	0.19	0.25	0.67		
5. Lift Residents	0.21	0.28	0.22	0.21	
6. Lift Violent Residents	0.02	0.12	0.17	0.11	0.72

*****Data include only nurses and aides who completed the long survey and who were worked on the same floor and shift for at least 50% of observations in the sample.

******When one outlier is removed this correlation is 0.50.

Table 16.

Risk of Injuries and Assaults Associated with Physical Exposures

Estimated by Conditional Logistic Regression: OR and 95% CI

	Injuries					
	Model 1		Model 2		Model 3	
6615 person-shifts	OR	95% CI	OR	95% CI	OR	95% CI
Log lifts per shift	1.4	1.1, 1.7			1.7	1.0, 2.9
Log average combative Interactions with residents			1.3	1.0, 1.5	0.8	0.5, 1.3

	Assaults					
	Model 1		Model 2		Model 3	
6931 person-shifts	OR	95% CI	OR	95% CI	OR	95% CI
Log lifts per shift	1.3	1.1, 1.6			1.0	0.6, 1.6
Log average combative Interactions with residents			1.3	1.1, 1.6	1.4	0.8, 2.2

Correlation between Lifts Per Shift and Combative Interactions = 0.92

Table 17.
Descriptive Statistics for Social Network Data

Number of Friends and Helpers in Facility*

	Mean	SD	N (Persons)
Friends	5.4	4.9	85
Helpers	8.0	4.8	61

Number of Friends and Helpers in Workgroup

	Mean	SD	N (Person-Shifts)
Friends	2.3	2.4	6370
Helpers	3.0	2.8	6350

*Ten individuals claimed to be friends with everyone in the facility. Thirty one individuals claimed they went to anyone in the facility for help.

Table 18.

Risk of Injuries and Assaults in Association with Number of Friends and Helpers in Workgroup

	Injuries							
	Model 1		Model 2		Model 3		Model 4	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Friends on Shift	1.03	0.93, 1.15	1.02	0.91, 1.14				
Helpers on Shift					1.04	0.95, 1.15	1.03	0.93, 1.14
Log Resident Lifting			1.56	1.05, 2.31			1.46	0.99, 2.14
	Assaults							
	Model 1		Model 2		Model 3		Model 4	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Friends on Shift	0.99	0.90, 1.10	0.99	0.90, 1.10			0.99	0.91, 1.08
Helpers on Shift					1.00	0.92, 1.09		
Log Resident Hostility			1.17	0.90, 1.51			1.18	0.90, 1.54

Table 19.

Odds Ratios for Previous Injuries or Assaults on Risk of Injury or Assaults

	Injuries			
	Model 1		Model 2	
	OR	95% CI	OR	95% CI
Injured Before	1.9	1.2, 3.0	1.7	1.0, 2.7
Log Resident Lifts			1.3	1.1, 1.7
Person-shifts	6855		6615	
	Assaults			
	Model 1		Model 2	
	OR	95% CI	OR	95% CI
Assaulted Before	1.8	1.2, 2.7	1.6	1.0, 2.4
Log Average Combative Interactions			1.3	1.1, 1.5
Person-shifts	6855		6391	

Table 20.

Odds Ratios for Being a "Regular" on Risk of Injuries or Assaults

	Injuries					
	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
Regular	1.7	1.0, 2.7	1.5	0.9, 2.5	1.5	0.9, 2.4
Log Lifts			1.3	1.0, 1.7	1.3	1.1, 1.6
Injured Before					1.5	0.9, 2.5
Person-shifts	6206		6206		6206	
	Assaults					
	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
Regular	2.0	1.3, 3.2	1.9	1.2, 3.0	1.8	1.1, 2.9
Log Combativeness			1.4	1.2, 1.7	1.4	1.1, 1.7
Assaulted Before					1.4	0.9, 2.2
Person-shifts	6369		6369		6369	

Table 21.

Odds Ratios of Effect of Being a Regular on Injuries and Assaults Analyzed Separately with Increasing Levels of Severity

	Injuries				
	Regular		Controlling for Lifts		
Severity	**OR**	**95% CI**	**OR**	**95% CI**	**N***
All Injuries	1.7	1.0, 2.7	1.5	0.9, 2.5	6206
Requiring At Least First Aid	2.4	1.1, 5.5	2.2	0.9, 5.0	2555
Requiring More Than First Aid	4.5	1.4, 14.2	4.1	1.3, 13.2	1994
	Assaults				
	Regular		Controlling for Hostility		
Severity	**OR**	**95% CI**	**OR**	**95% CI**	**N***
All Assaults	2.0	1.3, 3.2	1.9	1.2, 3.0	6369
Requiring At Least First Aid	2.5	0.9, 7.0	2.1	0.7, 5.9	1585
Requiring More Than First Aid	2.1	0.4, 10.5	1.9	0.4, 9.8	674

*Person-Shifts

Table 22.

Odds Ratios for Regulars Stratified by Nurses and CNAs

Injuries

	Model 1		Model 2		Model 3	
Nurses	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Regular	5.9	1.3, 25.8	5.6	1.3, 25.3	5.5	1.2, 24.7
Log Lifts			1.1	0.6, 2.1	1.1	0.5, 2.1
Injured Before					1.5	0.4, 5.2
N = 422*						

	Model 1		Model 2		Model 3	
CNAs	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Regular	1.3	0.8, 2.3	1.2	0.7, 2.0	1.1	0.7, 2.0
Log Lifts			1.5	1.0, 2.1	1.4	1.0, 2.1
Injured Before					1.6	0.9, 2.8
N = 3429*						

* Person-shifts

Assaults

	Model 1		Model 2		Model 3	
Nurses	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Regular	3.4	1.1, 10.7	3.1	1.0, 10.0	2.2	0.7, 7.4
Log Combativeness			1.4	0.8, 2.5	1.5	0.8, 2.7
Assaulted Before					4.5	1.7, 11.9
N = 418*						

	Model 1		Model 2		Model 3	
CNAs	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Regular	1.8	1.1, 2.9	1.7	1.0, 2.8	1.7	1.0, 2.8
Log Combativeness			1.4	1.1, 1.8	1.4	1.1, 1.8
Assaulted Before					1.0	0.6, 1.7
N = 4036*						

*Person-shifts

CHAPTER IV.
WORKGROUP CULTURE: TOWARDS A NEW HYPOTHESIS OF SOCIAL INTEGRATION AND RISK OF INJURY AND ASSAULT

BACKGROUND

The analyses of injuries and assaults to nurses and certified nurse assistants (CNAs), presented in the previous chapter, found that workers were at an increased risk of injury and assault while working on their regular floor and shift (for injury OR = 1.7, 95% CI 1.0, 2.7, for assault OR = 2.0, 95% CI 1.3, 3.2). These associations remained after controlling for group-level physical exposures including resident lifting and hostility, and previous injuries and assaults (for injury OR = 1.5, 95% CI 0.9, 2.4, for assault OR = 1.8, 95% CI 1.1, 2.9). Workers who were not a regular member of a workgroup were at *lower* risk of both assault and injury. This group included both those who were working on a floor or shift that was not that person's regularly assigned floor and those who were new hires, without sufficient time on the job to become a regular member of any workgroup. There are several different possible explanations for this substantial difference in risk between regular and non-regular workgroup members. In this chapter, these will be investigated using

quantitative data as well as qualitative findings from interviews and observations of the workplace.

Risks to Workgroup Regulars: Alternative Hypotheses

Four possible explanations of the associations between risk of injury and assault and being a workgroup "regular" were considered. Being a workgroup regular may provide added security so that reporting is better; regular employees may have more dangerous jobs; regular employees may work harder or longer hours; or the social structure of the regular working group may lead to accepting more risky tasks.

Status as a workgroup regular may instill a sense of security in the individual employee that increases his/her propensity to report injuries or assaults. This explanation seems unlikely in light of our previous findings (Chapter 3) that, there was an effect of being a regular for both more and less severe incidents. It would have been reasonable to assume that the association between being a workgroup regular and risk of injury or assault would be less for the more severe outcomes if reporting bias were the explanation for the observed association. It was shown, however, that the association between risk of injury and being a workgroup regular actually *increased* with the severity of the injury, and the association remained constant across assault severity categories. These results provide evidence against the hypothesis that workgroup regulars are not at higher risk of injury and assault, but merely report them more frequently.

A second possibility is that workgroup regulars may have a fundamentally different and more dangerous set of tasks than non-regular workers. For example, perhaps there was a system in which staff members more familiar with residents and coworkers were given additional responsibilities that put them at greater risk of physical overexertion or contacts with combative residents. No evidence for such a formal system has been identified. Interviews with certified nurse assistants (CNAs), floor nurses and administrators were carried out during data collection. Among other topics, they were asked about job tasks of different groups of workers and about their understanding of the division of labor, especially with regard to resident lifting and other resident contacts. There were consistent reports that CNAs had more resident contact, including lifting, than nurses. There were also differences in physical exposures by floor and shift (see Chapter 2). However there was no indication that systematic differences in hazardous exposures within job groups was a part of the official work organization of the facility. Nevertheless, we could not perform any analyses specifically to test this hypothesis.

A third possibility is that workgroup regulars simply worked harder, longer, or were more often physically worn out, and that this put them at greater risk of injury and assault. Some limited information to examine this hypothesis is possible using available data by exploring whether the associations between workgroup regulars and risk of injury and assault were confounded or modified by fatigue, burnout or decreased resilience. These analyses are described in this report (below).

A final possible explanation for the clustering of injuries and assaults among regulars has to do with the ways that membership in the social group of regular workers on a floor and shift may affect either individuals' work behaviors and their willingness to put themselves at risk, or residents' perception of and comfort with the staff members. This hypothesis involves a sociological effect of being a primary workgroup member and assumes that regulars are more socially integrated into the workgroup, subject to the norms and expectations of the group in ways that others are not. If these norms and expectations lead to greater physical exposures in the form of lifting and interacting with often-combative residents, then this may increase the risks of injury and assault. In addition to developing social group ties within the staff, relations with residents are also likely to develop through repeated care giving. It may be that those who get to know the residents over time make more and closer contact with the residents than those who do not know them as well. Examining this explanation for elevated risk of injury or assault among regular employees is the primary objective of this chapter.

Sociological Perspectives on Social Ties and Norms of Behavior

It is widely recognized in sociology that that repeated interactions with other individuals lead to the development of social ties and social norms (Simmel 1954, Gouldner 1960, Blau, 1960). Among the strongest social norms of the nursing profession is the professional ethos of providing care (Leininger, 1984, Reverby, 1987). Jervis (2002) stressed that nurses have a professional identity that is strongly based on their providing care *to the residents*. In her study of conflict

between nurses and aides working in a nursing home, she noted that nurses would exhibit care to the residents but provide little sympathy or understanding to the struggles of their nurse assistant coworkers. Not only was the care giving norm vigorously held by the nurses, but by directing it to the residents only, it was used by nurses in a manner to distinguish themselves from nurse assistants who held a lower position in the social hierarchy of their work organization. Thus, the norm existed and, in this case, was used to maintain social status distinctions among groups in the workplace.

This care-giving norm, like any other, takes time to be internalized. Although it is widely held among nurses, its content and enforcement may vary from facility to facility, or even workgroup to workgroup within a particular facility. It is through repeated interactions with the group that an individual learns the group's norms and the rewards and sanctions used to compel members to follow them. A group which rewards care-giving with group membership and other forms of status could compel workers to work harder and confer a higher risk of injury or assault because of with greater resident contact. The effect of this additional exposure might be particularly pronounced in this facility, since the residents all have psychological and behavioral needs that create demands in excess of those in standard long-term care facilities. The resident population is demanding because of both physical and mental limitations, staff turnover is substantial, and the facility must work very hard to meet minimum staffing levels.

In this study, identification of status as a workgroup regular was determined empirically by using staff schedule records to ascertain how frequently each staff member worked on the same floor and shift (see Chapter 3 for details on the construction of the variable). Repeated appearances on the same floor and shift imply repeated interactions with coworkers who also worked the same floor and shift, as well as with the same residents. Based on sociological theory, it was expected that repeated interactions with coworkers would typically lead to the integration of the individual into the group of other staff who also regularly work the same floor and shift. It is likely that most, if not all, individuals become integrated with the group with which they regularly work.

The residents form another essential component of the social environment in which workgroup dynamics occur. Through repeated interactions, workers gain familiarity with the residents and *vice versa*. Just as workers learn the needs and behaviors of the residents through repeated care-giving, it may be quite relevant to the likelihood of assault that residents with psychiatric impairments recognize some workers more than others.

METHODOLOGY

This was a 16-month cohort study of nurses and nurse aides working in a long-term care facility (see Chapter 3 for a detailed description of the workplace setting). Any nurse or aide who worked at least one shift on a date on which an injury or assault occurred, regardless of whether s/he was an employee of the institution or of an outside agency, was included in the study. This cohort consisted of 339 individuals, including 102 nurses and 233 CNAs and excluding supervisors.

One hundred ninety-nine events were included in the study: 90 injuries and 109 assaults. Only the self-reporting of an event to the facility was required for inclusion, although information on severity was collected from the routine injury reports (see Chapter 2). Injury and assault records were obtained from the facility's Medical Records Administrator and included all reported injuries and assaults. Incident reports provided type, result, body part, treatment provided and a short description of the event.

The shift schedules provided a record of attendance by date, floor and shift of each nurse and CNA who was working on each floor and shift for every date of the study period. Employment roster data were collected repeatedly. These data were obtained with greater frequency towards the end of the study period after it was learned that characteristics such as job title and employment status could change for

individuals. Therefore, there may be greater measurement error in these variables near the beginning of the study period.

There were three employment status categories in this workforce: standard employees (57%, N=187), per diem (19%, N=62) and pool workers (24%, N=80). The term “standard employees” represented those workers fully associated with the institution. As such, they were paid directly by the facility, had benefits, and could be required to work if needed. Per diem employees were also paid directly by the facility, earned a 15% premium in pay compared to standard employees but received no health coverage or other benefits. They worked on an as-needed basis, and came in when called, but could refuse to work if they chose to. Pool workers were nurses and CNAs who were employed and paid by an external temporary employment agency and who provided coverage on an as-needed basis. They were not paid directly by the facility and were called to work when the facility was short of staff and could not fill its needs with either standard or per diem employees to provide necessary coverage.

Surveys were distributed twice. The first one was longer and the second one much shorter, in an attempt to improve response. Survey data were collected from 94 individuals and were available (at least one survey) for 56 of the 90 (62%) total injuries and 69 of the 109 (63%) reported assaults. Survey items used in this study include demographics such as age, employment status, job title, hours per week worked, Job Content Questionnaire scales, and the social network data pertaining of

lists of coworkers identified as friends or those one approach for help for lifting residents and other physically demanding tasks.

To assess the amount of resident contact required as a part of routine resident care, staff members were interviewed. Four CNAs, each of whom was a regular employee on her respective floor, were accompanied by the investigator around the entire floor and asked to rate the lifting needs and behavioral aggressiveness of each resident. The number of lifts required on an average day for each resident was recorded as was the frequency of "combative" behavior displayed on an average day by each resident. Interviews were also done to determine the variability in physical demands by shift and by job title. Physical demands were measured once and these scores were applied to the entire study period. In the previous paper, a curvilinear relationship between lifting and risk of injury was found. A similar curvilinear relationship was found between resident combativeness and risk of assault. Therefore the log transformations of the lifting requirements and of resident combativeness were used in the modeling (see Chapter 3).

Workgroup Regulars

A workgroup was defined as all nurses and aides working on any given floor and shift for the eight hour work-shift. Workgroups are dynamic; since individuals do not work every day and may work on different floors or shifts from day to day. A dummy variable was created to indicate, for each person-shift, whether a person was working on a floor and shift familiar to her/him. The workgroup regular variable was created for each worker on each day that s/he appeared in the dataset by looking back

at each worker's seven most recent appearances in the dataset. Seven was chosen because, on average, there were two months between any seven observations within each worker and two months was considered sufficient time to become reasonably integrated with coworkers.

In the definition of workgroup "regular" adopted for this study, a worker had to have worked at least five of the previous seven times on the same floor and shift. Thus some rotation to other floors or shifts was allowed within the definition of a regular since in this facility it was common occasionally to cover a floor or shift that one did not work regularly. It is important to stress that, by this definition, being a regular is a dynamic state and changes from day to day. For example, if a worker was yesterday a regular on shift 1 floor 1, but today was working on shift 2 floor1, then he/she was not a regular today. If s/he's injured today, that injury will be classified as occurring to a non-regular worker, because he/she was not working in his/her regular workgroup at that time.

The following are ways that one would *not* meet the definition of a regular: a) working on a floor or shift that was not that person's regularly assigned floor; b) being a new hire, without sufficient time on the job to become a regular member of any workgroup; c) routinely working a variety of different floors and shifts; or d) working too infrequently to become a regular member of any single workgroup.

Other Work Characteristics

The workgroup regular variable was dynamic and applied to each person-shift. A fixed characteristic of each individual identified whether each person was or

was not a regular member of *some* workgroup. A worker was defined to be a "primary group member" if at least 50% of all shifts he/she worked in the study period was worked while a workgroup regular.

The validity of this definition of primary group member was evaluated by comparing it to a question from the short survey in which respondents were asked if they usually worked the same floor and shift or if they usually worked different floors and shifts (Table 24). Ninety-four percent of those defined as primary group members said they usually worked the same floor and shift, while 68% of those identified as not primary workgroup members claimed to usually work different floors and shifts (chi-square = 30.7, 1 df, $p<0.001$).

Working a double shift was investigated as a way to characterized work-induced fatigue. A double-shift was defined as a second consecutive shift, regardless of the floor assignment. About ten percent of all shifts worked in this study period were worked after already working an eight-hour shift.

Date of hire was obtained from employee rosters but was not available for any pool agency workers. Age and hours per week worked were gathered from the two survey questionnaires. For summary statistics, tenure was determined by subtracting the date of hire from the last date observed in the study for each individual. However, for modeling risk of injury and assault, tenure was a time-varying parameter, calculated as the date of each person-shift minus the individual's date of hire.

Job Content Questionnaire

The 49-question version of the Job Content Questionnaire (JCQ) was administered in the first round of surveys. This provided a description of demands, control and support perceived by the workers. Mean score for the JCQ scales were calculated for the sub-sample of 44 respondents who filled out the survey as well as for several subcategories of workers classified by job title, employment status and primary group workers.

RESULTS

Workgroup regulars appeared more on the first shift than on the second or third. There was moderate variance by floor in the frequency of workgroup regulars. Average age, hours per week worked and tenure also varied by workgroup regular status (Table 24).

Hypothesis of Accumulated Fatigue

The hypothesis that the increased risk to regulars was due to fatigue, burnout or decreased resilience was investigated in several ways, primarily by examining the experience of those working double-shifts. One might hypothesize that working a double shift would increase injury or assault risk if fatigue were an important determinant of risk. It is plausible that when working a second straight shift, physical and mental exhaustion can to lead to an increase in injury or assault risk. This did not appear to be the case in these data (Table 25). While working a second straight shift, workers actually experienced a *decreased* risk of injury and assault, on average. For injuries the odds ratio was 0.4, and for assaults it was also 0.4. Because the risks for the two types of events were similarly associated with double shift work, a combined model was constructed. The risk of injury or assault when working a second shift in a row was sixty percent lower than when working a single shift (OR = 0.4, 95% CI 0.2, 0.8). Controlling for being a workgroup regular changed this association very little

(OR = 0.5), nor did controlling for physical exposures (lifting and behavioral events) change the result (OR = 0.5).

Data on age, tenure and hours per week worked were included in regression models of injuries and assaults because if any of these were associated with risk, it might support the argument that some long-term burnout was responsible for the increased risk found among workgroup regulars. Unfortunately, these analyses were hampered by limited data. Information on age and hours per week worked was gathered by surveys and therefore available for only about one half of all person-shift observations. Within these data limitations, we did not observe any evidence that age, job tenure, or the number of hours worked per week were associated with risk of injury or assault (Table 26). Controlling for physical exposures did not change these results. These negative results suggest that it is unlikely that the effect of being a workgroup regular was confounded by any of these variables.

The Social Integration Hypothesis

We hypothesize that being socially integrated into a workgroup subjects a worker to the norms of the group, which puts its members at risk of injury and assault by demanding that they do more caring for the residents than would be compatible with also caring for themselves. Because of chronic short staffing and the serious physical and psychological needs of almost every resident, the level of care demanded by the workgroup may often exceed the physical and emotional abilities of the staff. Those who are not workgroup regulars, by contrast, are at a relatively lower risk of injury or assault because they are not subjected to the same expectations

regarding care for the residents. There are several ways that this hypothesis was investigated.

Job Status as a Proxy for Integration

Employment status represents an alternative way to view social integration, which may shed light on the observed risk associated with being a workgroup regular. Pool workers were unlikely to identify with the facility as much as standard or per diem employees. While per diem workers may have worked as often as standard employees, the facility placed fewer demands on them compared to standard employees. In addition, interviews with staff and administrators supported the view that per diem workers did not identify with the organization to the same degree as standard employees did. For example, during the survey periods, several per diem workers questioned whether they should take part because of their more "distant" connection to the facility, and others simply declared that they would not participate for the same reason. Thus the 3 categories of employment status provide a plausible scaling of organizational integration from pool workers (least integrated), through per diem employees, to standard employees (most integrated).

The number of person-shifts that were worked by workgroup regulars decreases dramatically across these three categories, in the predicted direction (Table 27). This confirms that the per diem employees and pool workers were not as integrated as standard employees.

This categorization by employment status was utilized as an alternative way to investigate whether risks of injury and assault varied by the degree to which workers

were integrated into the organization. Conditional logistic regression results showed that job status predicted risk of injury and assault (Table 28). Per diem workers had a risk of injury that was forty percent lower (OR = 0.6), and pool workers had risk of injury eighty percent lower (OR = 0.2), than standard full-time employees. After controlling for lifting exposures, these associations were only slightly reduced. A similar pattern was found with risk of assault. The odds ratio for per diem workers compared to full-time workers was 0.7 (95% CI 0.4, 1.2) and 0.3 for pool workers compared to full-time employees (95% CI 0.1, 1.4). Controlling for exposure to resident hostility changed these associations very little.

While these effects were not very precise, they did show a dose-response relationship between degree of worker integration and risk of injury and risk of assault. Since the magnitude of the effects for injury and assault risk were very similar, injuries and assaults were combined to gain statistical power. This resulted in associations with very similar magnitudes but with greater precision of the estimates. For the risk of injury *or* assault the odds ratio for per diem employees was 0.7 and 0.3 for pool workers compared to full-time employees. Once again, adjustment for physical exposures, both lifting and resident hostility, changed these results very little.

While employment status showed an analogous association with risk, it did not appear to function as a simple proxy or equivalent for the effect of being a workgroup regular. One piece of evidence for this was the observation that, when analyses were restricted only to standard employees, being a workgroup regular

remained a risk factor for both injury and assault (for injury OR = 1.6, for assault OR = 1.7). This effect was unchanged when controlling for physical exposures (Table 29).

When employment status and the workgroup regular variable were included in the same model, the dose-response relationship between employment status and risk of injury remained (Table 30). Not surprisingly, this association became a little weaker since these variables were correlated, but the dose-response relationship could still be seen. For assaults, the association with employment status disappeared, once the workgroup regular variable was included in the model.

Workgroup Regular Nurses Versus CNAs

The effect of being a workgroup regular, for both injuries and assaults, was modified by job title. For injuries, the effect of being a workgroup regular was very dramatic among nurses and unimportant among CNAs (Table 22). For assaults, the difference between nurses and CNAs was far less marked but still showed a higher risk in nurses. Thus, overall, the effect of being a workgroup regular was stronger among nurses than among CNAs.

Psychosocial Stress and Social Integration

The psychosocial measures of the Job Content Questionnaire varied very little by job title, employment status and by whether or not someone was a primary group member (Table 31). This last variable is the static corollary of the time-varying workgroup regular measure (see Methods). Standard employees reported greater skill discretion and decision authority, and hence decision latitude, than per diem employees (for decision latitude $t = 2.0$, 40 df, $p = 0.05$). Nurses reported greater psychological demands than CNAs although this difference was not statistically significant at the $\alpha = 0.10$ level. Although the dataset is limited and incomplete because of difficulties in getting staff to complete surveys, the results suggested little difference *overall* in either demands or control among the different categories. However, the few differences that were found are consistent with some psychosocial stress hypotheses (Karasek and Theorell, 1990). It is unlikely that differences in these aspects of the work organization completely explain the pattern of risk among regulars compared to non-regulars.

DISCUSSION

In this chapter, we explored some possible explanations for the increased risk of injury and assault among nursing home workers who were working with their regular coworkers. After examining reporting bias and any officially designated systematic differential in job duties between workgroup regular and non-regular employees (using qualitative interview data gathered at the study site), two other possible explanations were examined here.

First, it was possible that the effect of workgroup "regular" variable represented the excess risk of injury, and possibly assault, due to the regulars working more often and being fatigued or burned out from working more than other employees. This idea was tested with different indicators of amount of work done. Hours per week worked was used to represent a measure of work intensity while both tenure and age were used to represent long-term fatigue. None of these three variables was a predictor of level of risk of injury or assault nor did they confound the association of the excess risk of injury or assault among workgroup regulars. However, missing values for each of these variables led to reduced statistical power.

The results that indicate a *lower* risk of injury or assault while working a second straight shift were surprising and unexpected. Since working two eight-hour shifts in a row should predict greater fatigue, on average, than would be experienced

on a single shift, this finding argues against an explanation that workgroup regulars are being injured or assaulted because they are fatigued. Not only do these findings contradict the fatigue hypothesis, but surprisingly they may also suggest the importance of social integration with a workgroup as a risk factor. When one works a double shift, one is, by definition, a non-regular on one of the two back-to-back shifts (nearly always the second of the two consecutive shifts), and perhaps subjected to reduced workgroup expectations because of being an "outsider".

The Social Integration Hypothesis

Nurses have a powerful culture of caring (Leininger, 1984, Reverby, 1987). It is considered to be their primary value, and a professional ethic instilled during their training and reinforced on the job. It is possible that this identity as caregivers is a means through which individuals gain membership in the group; that through demonstrating their devotion to their residents, they gain acceptance by others. To prove their worthiness to enter the group, nurses readily tend to the residents—it is what nurses are *supposed* to do—and continue to do so to maintain their status as group members, even at the cost of their safety and well-being (*find the other literature on this—I'm trying*). This is consistent with the notion that repeated interactions lead to the understanding and acceptance of norms and therefore integration with the group. In a dangerous environment, such as this long-term care facility housing residents with psychiatric disorders, these efforts to gain and maintain membership of the group likely bring with them a greater risk of injury and assault.

It may actually be through performing dangerous tasks that individuals gain respect of their coworkers. This kind of reward is known as symbolic recompense (Dwyer, 1991). In this case, individuals are offered non-material rewards such as prestige and acceptance for performing tasks considered risky or undesirable by others. In a study of Native American steelworkers, Hass (Haas, 1977, cited in Dwyer, 1991) described how workers performed dangerous tasks because doing so fit with their culture of heroism. They were rewarded with status and prestige, and their heroic identity was confirmed through their bravery.

In the famous experimental studies of workers at the Western Electric Company's Hawthorne plant in Chicago (Roethlisberger and Dickson, 1939), 14 workers were randomly chosen from the plant and set up in a separate room to do their tasks of wiring phone banks. The workers quickly formed relationships with each other, and in a short period, two subgroups emerged along division of tasks, with the more prestigious group performing work that required more skill. Norms regarding individual productivity quickly developed as well. Those who broke the norms were punished with isolation or were called names if they were not clique members. Group norms were so strong that workers, paid on a piece-rate basis, would under-report their productivity to avoid making their coworkers look bad and risk being ostracized. By picking up slack for others and going unpaid in the process, workers would gain status with their coworkers and solidify their identity as group members. In this study, it may be that nurses were rewarded with group acceptance,

and their identity as caregivers was confirmed, by performing tasks which put them at greater risk of injury or assault.

It may be that competition for status is another reason that some nurses put themselves at risk of injury by over-extending themselves in their resident care activities. Jervis (2002) stated that status distinctions between nurses and aides were very strong. So strong was this division, she reports, that nurses who developed personal ties with the CNAs they supervised, or helped them with their work, were seen by top staff as unprofessional. In this study, it may be that nurses attempt to demonstrate this status differential not only between themselves and CNAs but also between themselves and "outsider" nurses who are not perceived to be as committed to their workgroup, the facility or the residents as are "real" nurses. The results of this study show that the excess risk to workgroup regulars compared to non-regulars was very strong among nurses, much stronger than among CNAs (Table 22). This suggests that the professional culture among nurses, which is not systematically instilled among CNAs, may lead nurses to put themselves at greater risk of injury than their non-regular coworkers.

As noted above, per diem employees were less often workgroup regulars than standard employees, and pool workers were less often workgroup regulars than were per diem employees. Qualitative data above also suggested that per diem workers did not identify with the workplace as much as standard employees did. Pool agency workers are not expected to identify with the organization, since they have a separate employer, and the data showed that almost none of them worked at this facility

enough to become regular workgroup members. Clearly, then, employment status is a marker for social integration with the workplace; with standard employees being the most tightly integrated, followed by per diems, and then pool workers. The risk of injury followed this gradient and could not have been explained by other variables in this study. Even when controlling for being a workgroup regular, this gradient remained. Although physical exposure data were not measured at the individual level, in this workplace, the culture of the workers did not seem to involve shifting the heavy work on to the "outsiders."

The effect of being a regular could be seen even when restricting the analysis to the group of standard employees (Table 28). Being a standard employee and a workgroup regular seem to mean different things. It may be that employment status suggests another dimension to group membership and workgroup integration in addition to repeated appearances at work. This would mean that the further "out" one is socially, the lower the degree to which the nursing culture has a hold on the worker. Employment status and workgroup regular are BOTH risk factors, and so the social hierarchy is more complicated, which is not surprising given the perspective offered by the Jervis study (2002). But, in this study, we can't sufficiently specify all the dimensions of that social order with our crude instruments.

Finally, since working a double-shift increases fatigue it was expected that there would be an increase in risk on these person-shifts. The fact that risk of injury was *lower* was surprising. However, it was noted that the worker was almost always *not* a workgroup regular while working the second of a double. Therefore, the

reduced risk of injury while working a double could be consistent with the fact that non-workgroup regulars were seen to be at lower risk in general They likely still have the ethic of care for their residents, but they may have been exempted from their expectations because they were not working among those who have the high expectations of them.

In summary then, the data suggest that workers who are better integrated with the group as a result of repeated interactions, and possibly through the social meaning of their employment status, are more highly subjected to the ethos of the nursing profession which pressures nurses to put themselves in harms way by closely attending to residents under their care. One might say that peer pressure pushes nurses to engage in risky behaviors.

Workgroup integration, norms and expectations may be only a partial explanation for the excess risk of assault to workgroup regulars. While the same variable, workgroup regular, was used to model risk of assault as well as injury, this variable is not only a measure of repeated interactions with coworkers, but also an incidental measure of repeated interactions with residents. The excess risk of assault among workgroup regulars is greater than the excess risk of injury. This suggests either a more intense effect of workgroup integration for this outcome, or that it is capturing more than one source of risk. We hypothesize that repeated interactions with the residents is an additional component of being a workgroup regular, and that this provides at least part of the explanation behind the observed excess risk of assault to workgroup regulars.

The residents, all of whom have psychiatric disorders, would likely recognize the faces of their caregivers but not at all be aware of their official employment status, let alone behave differently towards them based on this distinction. Among the residents, employment status does not have the meaning it appears to have among the staff.

Stratification by job title also suggests a different explanation of the excess risk of assault than was offered for injury (Table 30). Among nurses, workgroup regulars are still at a high excess risk of assault compared to non-regulars, higher than that for CNAs. This is consistent with the injury finding, although it is not as strong. However, among CNAs, there is an association between workgroup regulars and risk of assault, unlike for risk of injury. This suggests that some factor may be putting CNA regulars at risk of assault that is not putting them at risk of injury. It may be that regularly appearing employees are at a greater risk of assault regardless of integration with coworkers, employment status, or job title simply because the residents recognize them more readily as a result repeated contact. It may also be that workers who are familiar with residents are less fearful of these residents and are assaulted unexpectedly. This still suggests that repeated interactions with residents are behind the observed increase in risk.

The excess risk of assault among regular nurses compared to non-regular nurses is higher than that found between regular and non-regular CNAs. It may be that their professional culture explains this more dramatic difference among the nurses. It is possible that the regular nurses are exposed to the residents more and

that, because they are familiar to the residents, are the victims of assaults more than non-regular nurses.

Physical Exposure and Workgroup Regulars

Our analyses lead us to the conclusion that workgroup regulars do more work in the form of resident contact than non-regulars. Of course, holding a social norm or value is not, by itself, likely to produce an injury or assault. But it is believed that social norms played a part in distributing physical exposures in this workplace. Recall that in this investigation, physical exposures were measured at the level of the floor, adjusted for shift, and applied to the entire study period. Thus, physical exposure was a group level variable, summarizing the amount of work that someone had to do, within the shift. Because the patient population is so physically and psychologically handicapped, there was little possibility of deviating from the number of lifts and other patient interactions that had to be accomplished. Every meal, every trip to the toilet, every trip outside to smoke, and so on, had to involve a certain level of effort. But since this effort was measured at the group level, the distribution of this effort among workgroup members could, and apparently did, vary considerably depending on social factors. Our evidence suggests that the excess risk of injury and assault observed to be associated with being a workgroup regular is explained by the tendency of this group to assume a disproportionate amount of the effort, or exposure.

Had physical exposures been measured at the individual level, then perhaps we might have observed an even stronger association between the physical exposures and risks. However, the utility of not measuring exposures in such a precise way is

that it allowed for the injury and assault risks associated with this possible differential in exposures to be observed. Thus, the discovery of the association between risk of injury and assault that appeared among those who have likely made ties with coworkers and residents suggests the importance of the informal social structures that determine, in part, how a workload may be distributed in a workgroup. Physical exposures measured at the individual level could be aggregated to show mean differences by workgroup regular and non-regular status. This would confirm that it was the distribution of workload by this social division that was behind the observed risks.

Perceptions of job demands, control and support as measured by the Job Content Questionnaire were not markedly different by primary/non-primary worker status (or by job title or employment status). Nurses did report slightly higher level of psychological demands than CNAs and standard employees reported a greater level of skill discretion and decision authority than per diem workers. The lack of differences of these variables between primary and non-primary employees suggests that these factors do not likely explain the excess risk of injury and assault risk found among workgroup regulars. Although too few data were gathered to use in regression models, if the sample was representative, these variables did not confound the excess risk among workgroup regulars. If job demands were behind these associations, there should have been greater demands perceived by primary workgroup members. While primary group members did report higher physical demands, this difference was small and psychological demands between these categories were the same. It may be that,

on average, these demands are the same across category; however, when working in a group in which one does not typically work, these demands might be very different.

CONCLUSIONS

In this chapter, we argued that the results shown in Chapter 3 concerning the elevated risk of injury among workers working with coworkers they normally work with could be explained as a function of social norms and expectations of other workgroup members. It was argued that through repeated interactions with coworkers, individuals learned the group's norms and expectations concerning behavior at work and that workers complied with these norms to gain and maintain membership and status with the group. As a result of complying with these expectations, workgroup regulars were thought to have greater physical demands and resident contact and therefore an elevated risk of injury. In addition, it may be that residents were more likely to assault workers with whom they were more familiar. It was also suggested that workers who were familiar with residents might have been assaulted more often because they felt safer around residents for whom they repeatedly care.

In interpreting these findings, it may be helpful to take the perspective of those who were *not* workgroup regulars. Among this group, there was a substantial *decrease* in risk – about a 50% decrease compared to workgroup regulars. This is simply an alternative view of the same finding, but it may be useful to take this

perspective when considering the implications for prevention. These will be discussed in the concluding chapter.

It is not recommended that any generalizations of these results be made beyond long-term healthcare facilities. The implications of group membership are probably very different in different institutions. In some cases, it may be that being a group member lowers risk. For example, it may be that workers seen as "one of us" are given lighter duties and "outsiders" are given the more dangerous tasks. Being a workgroup regular means that one is subjected to norms and expectations that must be followed if one is to be treated as part of the group. To understand how these norms operate regarding risk of injury, the culture of the group must be understood and culture may vary from workplace to workplace.

Even within long-term care facilities, generalizations must be made with caution. This was a dual-diagnosis facility with an unusually dangerous population that had psychiatric disorders as well as physical ailments. This clientele seems to have resulted in an unusually high rate of assaults in this facility. There may be less dramatic effects in less environments with residents or patients who are not as combative. It is also worth pointing out that because this was a long-term care facility it was possible for workers to develop ties with residents in a manner not likely to be found in most hospitals or other healthcare facilities that do not serve long-term clients.

The theme of this chapter was that sociological forces including culture, norms and expectation of behavior at work and informal group dynamics partly

determine the distribution of physical exposures and subsequent risk of work-related injury and assault. These results have direct implications for studies of hazardous exposures in a variety of workplaces as well as studies of the risk occupational injuries and assaults. More broadly, these results indicate the need to consider a wide range of sociological forces that go beyond analysis of individuals' perceptions when studying a variety of health outcomes in the workplace and beyond.

LITERATURE CITED

1. Blau, PM. 1960. A Theory of Social Integration. Amer J of Sociology, Vol. 65, No. 6 (May), pp. 545-556

2. Dwyer, T. 1991. Life and death at work, industrial accidents as a case for socially produced error. Plenum Press, New York.

3. Gouldner, A. 1960. The Norm of Reciprocity. Amer Sociological Rev. 25:161-178.

4. Jervis, L.L. 2002. Working in and around the 'chain of command': power relations among nursing staff in an urban nursing home. Nursing Inquiry 9(1): 12–23.

5. Karasek, R and Theorell, T. 1990. Healthy Work, Stress, Productivity and the Reconstruction of Working Life. Basic Books, New York.

6. Leininger, M.M. 1984. Care: The essence of nursing and health. Slack, New Jersey.

7. Melosh B. 1982. 'The physician's hand': Work culture and conflict in American nursing. Philadelphia: Temple University Press.

8. Reverby SM. 1987. Ordered to care: The dilemma of American nursing, 1850–945. Cambridge: Cambridge University Press.

9. Roethlisberger, F.J., & Dickson, W.J. (1939). Management and the worker. Cambridge: Harvard University Press.

10. Simmel G. (1950). The Sociology of Georg Simmel, translated and edited by Kurt H. Wolff. Glencoe, Ill.: Free Press.

TABLES

Table 23.

Cross-tabulation of Workers Usually Working the Same Floor and Shift with Primary Workgroup Member Status, Among Survey Respondents Employed in One Nursing Home

Primary Group Member Usually Work the Same Floor and Shift			
	No	**Yes**	**Total**
No	13	3	16
	68.4	**5.9**	
Yes	6	48	54
	31.6	**94.1**	
Total	19	51	70

Table 24.

Floor, Shift, Job Title and "Fatigue" Variables by Workgroup Regular/Non-regular Status

Shift	Workgroup Regular	Workgroup Non-Regular
First	69.1	30.9
Second	49.4	50.6
Third	51.0	49.1
Person-shifts	6855	4941
Floor		
Ground	54.0	46.0
First	61.3	38.7
Second	58.3	41.7
Third	57.0	43.0
Person-shifts	6855	4941
Job Title		
CNAs	58.2	41.8
Nurses	57.9	42.1
Person-shifts	6855	4937
Means		**Person-shifts**
Age	37.5*	37.0	5922
Hours per week	38.3**	43.1	6222
Tenure in years	3.6**	2.6	10762

*p<0.10

**p<0.05

Table 25.

Conditional Logistic Regression Models: Risk of Injury and Assault - While Working a Second Consecutive Shift versus a Single Shift

Injury (n = 86)	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Second Consecutive Shift	0.4	0.1, 1.1			0.5	0.2, 1.4
Log Lifts Per Shift			1.4	1.1, 1.7	1.3	1.1, 1.7
Assault (n = 103)	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Second Consecutive Shift	0.4	0.1, 1.0			0.4	0.2, 1.2
Log Combative Events			1.3	1.1, 1.6	1.3	1.1, 1.5
Injury and Assault Combined (n = 189)	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Second Consecutive Shift	0.4	0.2, 0.8			0.5	0.2, 1.0
Log Lifts Per Shift			1.3	0.9, 1.9	1.2	0.8, 1.5
Log Combative Events			1.0	0.8, 1.4	1.1	0.9, 1.8

Table 26.

Conditional Logistic Regression Models: Risk of Injury and Assault - Associated with Age, Tenure and Hours per Week Worked

Injury	OR	95% CI	Person-Shifts	Injuries
Age	1.00	0.98, 1.03	2160	55
Tenure in Years	1.03	0.88, 1.20	5962	84
Hours per Week Worked	0.98	0.96, 1.01	2224	55
Assault	**OR**	**95% CI**	**Person-Shifts**	**Assaults**
Age	0.99	0.97, 1.01	2657	70
Tenure in Years	1.01	0.94, 1.08	6118	99
Hours per Week Worked	1.01	0.98, 1.03	2788	70

Table 27.

Proportion of Workgroup Regular Person-shifts by Employment Status

	Proportion of Shifts as Workgroup Regular	S.D.	Person-shifts
Standard Employees	0.71	0.45	8997
Per Diem Employees	0.20	0.40	2202
Pool Workers	0.06	0.23	582
Total	0.58	0.49	11781

Table 28.

Conditional Logistic Regression Models: Risk of Injury and Assault by Job Status

	Injury		Assault		Injury and Assault Combined	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Standard Employees	--	--	--	--	--	--
Per Diem Employees	0.6	0.3, 1.1	0.7	0.4, 1.2	0.7	0.4, 1.0
Pool Workers	0.2	0.0, 1.6	0.3	0.1, 1.4	0.3	0.1, 0.9
Additional Models Controlling for Physical Exposures						
Standard Employees	--	--	--	--		
Per Diem Employees	0.7	0.4, 1.3	0.7	0.4, 1.3	0.7	0.5, 1.1
Pool Workers	0.3	0.0. 2.0	0.4	0.1, 1.7	0.3	0.1, 1.1
Log of Resident Lifting	1.3	1.1, 1.7	--	--	1.3	0.9, 1.8
Log of Resident Combativeness	--	--	1.3	1.1, 1.5	1.0	0.8, 1.4

Table 29.

Risk of Injury and Assault by Workgroup Regulars for All Employees and Restricting to Standard Employees

Injury

Effect of Being a Regular Among:	Model 1 OR	Model 1 95% CI	Model 2 OR	Model 2 95% CI	Model 3 OR	Model 3 95% CI	Model 4 OR	Model 4 95% CI
All Employees (N*=6206)	1.7	1.0, 2.7	--	--	1.5	0.9, 2.5	--	--
Standard Employees Only (N* =4145)	--	--	1.6	0.9, 2.7	--	--	1.6	0.8, 2.9
Log of Resident Lifting	--	--	--	--	1.3	1.0, 1.7	1.3	1.0, 1.7

Assault

Effect of Being a Regular Among:	Model 1 OR	Model 1 95% CI	Model 2 OR	Model 2 95% CI	Model 3 OR	Model 3 95% CI	Model 4 OR	Model 4 95% CI
All Employees (N*=6206)	2.0	1.0, 3.0	--	--	1.9	1.2, 3.0	--	--
Standard Employees Only (N*=4212)	--	--	1.7	1.3, 3.2	--	--	1.7	1.0, 3.0
Log of Resident Combativeness	--	--	--	--	1.4	1.2, 1.7	1.5	1.2, 1.9

Table 30.

Association Between Employment Status and Risk, Controlling for Physical Exposures and Being a Workgroup Regular

	Model 1		Model 2		Model 3	
Injuries	OR	95% CI	OR	95% CI	OR	95% CI
Regular Indicator	1.5	0.9, 2.5			1.3	0.8, 2.2
Per Diem Indicator			0.7	0.4, 1.3	0.8	0.4, 1.6
Pool Worker Indicator			0.3	0.0, 2.0	0.3	0.0, 2.5
Log Resident Lifting	1.3	1.0, 1.7	1.3	1.1, 1.7	1.3	1.0, 1.6
Assaults						
Regular Indicator	1.9	1.2, 3.0			1.8	1.1, 3.1
Per Diem Indicator			0.7	0.4, 1.3	1.0	0.5, 1.9
Pool Worker Indicator			0.4	0.1, 1.7	0.6	0.1, 2.8
Log Resident Combative Interactions	1.4	1.2, 1.7	1.3	1.1, 1.5	1.4	1.2, 1.7

Table 31.

Mean Job Content Questionnaire Scores by Job Title, Employment Status and Primary Workgroup Status

	Total Cohort		Job Title			
			CNAs		Nurses	
	Mean	N	Mean	N	Mean	N
Skill Discretion	34.6	43	34.3	28	35.1	15
Decision Latitude	43.0	42	42.8	27	43.5	15
Decision Authority	33.8	42	33.9	27	33.6	15
Psychological Demands	35.4	37	34.3	24	37.3	13
Job Insecurity	4.3	43	4.4	28	4.0	15
Coworker Support	12.1	44	12.2	29	11.9	15
Supervisor Support	12.4	40	12.8	26	11.5	15
Social Support	24.5	40	25.0	26	23.4	14
Physical Exertion	3.1	44	3.2	29	2.9	15
Emotional Attachment	3.4	44	3.4	29	3.4	15
Number of friends in institution	6.1	93	6.6	69	4.6	24
Usually Works Same Floor & Shift	77%	70	80%	56	64%	14

	Employment Status				Primary Workgroup Member			
	Full-Time		Per Diem		Yes		No	
	Mean	N	Mean	N	Mean	N	Mean	N
Skill Discretion	35.2	33	32.4	10	34.7	28	34.3	15
Decision Latitude	70.0	32	63.2	10	68.4	27	64.8	15
Decision Authority	34.8	33	30.8	10	33.6	27	34.1	15
Psychological Demands	35.1	28	36.1	8	35.4	25	35.3	12
Job Insecurity	4.2	34	4.6	10	4.3	28	4.4	15
Coworker Support	12.1	35	12.0	10	12.0	29	12.3	15
Supervisor Support	12.4	32	12.0	9	12.3	26	12.4	14
Social Support	24.6	32	24.0	9	24.3	26	24.6	14
Physical Exertion	3.1	35	3.1	10	3.2	29	2.9	15
Emotional Attachment	3.5	35	3.1	10	3.4	29	3.3	15
Number of friends in institution	6.5	75	4.9	16	5.8	29	5.6	15
Usually Works Same Floor & Shift	92%	56	15%	13	94%	51	31%	19

CHAPTER V.
CONCLUSIONS

Epidemiologic research has identified a variety of factors that modify the risk of work-related injuries. These include physical safety hazards, unsafe work practices, and ergonomic stressors. But despite this body of research and many attempts to reduce these known risk factors, the rate of injuries among nurses and nurse assistants has been fairly stable, and unfortunately high, over the past decade. This study focused on the roles that social networks play in modifying the effects of workplace hazards. We hypothesized that a better understanding of the ways in which social networks can modify the risk of injuries could provide new strategies for injury prevention.

The purpose of this pilot study was to explore the hypothesis that the social organization of the workplace, as measured by social network analysis, affects the incidence of work-related injuries. This pilot epidemiologic study applied both established and newly-developed measures of social networks to describe the social organization of a workplace in order to examine the relationship of elements of the organization to workplace injuries. Since the focus of this research was on the relations among workers, not properties of each individual worker, this study was an opportunity to open new perspectives on the etiology of workplace injuries that go beyond individual worker characteristics. The study results, while far from

conclusive, provide important insights into the roles of social factors in the injury process and have generated new hypotheses for future research in this area. This study was also an opportunity to span the disciplinary boundaries of epidemiology and sociology that expanded the range of theoretical and methodological approaches used in the study and prevention of occupational injuries.

The study was based on a 16-month prospective follow-up study of nurses and certified nurse assistants (CNA's) working in a psychiatric hospital. Any nurse or aide who worked at least one shift on a date on which an injury or assault occurred, regardless of whether s/he was an employee of the institution or of an outside agency, was included in the study. This cohort consisted of 339 individuals, including 102 nurses and 233 CNAs and excluding supervisors. One hundred ninety-nine events were included in the study: 90 injuries and 109 assaults. Only the self-reporting of an event to the facility was required for inclusion, although information on severity was collected from the routine injury reports (see Chapter 2). Injury and assault records were obtained from the facility's Medical Records Administrator and included all reported injuries and assaults. Incident reports provided type, result, body part, treatment provided and a short description of the event.

Injuries and Assaults

The incidence rate of injuries was 55.6 per 100 ftes per year, while for assaults it was somewhat higher -- 67.3 per 100 ftes per year. These translate into annual cumulative incidences, or risks, of 0.40 for injury and 0.47 for assault (chapter 2). While these seem unacceptably high in absolute terms, they are not out of line with

other health care facilities. For example, in a previous study of nursing home works, self-reported back and shoulder injuries alone occurred at nearly the same rate as total injuries in the present study (Myers, *et al*, 2002). This facility did appear to have a high rate of assaults, however. Arnetz (1998) reported an assault rate about half that seen here -- 31 assaults per 100 person-years among practical nurses working in a large hospital in Sweden. This group had the highest assault incidence rate of any job title in their facility, including nurse aides. The high assault rate may explain why the administrators of this facility were told by their superiors that the "injury" rate (including both injuries and assaults) was the highest among all facilities in the healthcare system of which they were a part.

About 47% of all injuries (and 24% of assaults) required medical treatment (Chapter 2). This pattern held also for the most severe events – those requiring more than first aid. The rate of injuries requiring clinical care was twice as high as the rate of assaults requiring clinical care. Emergency room visits occurred for injuries at a rate nearly four times that of those for assaults.

At the outset of this study, injuries and assaults were analyzed separately. This is because they were seen as having distinct causes. While studying suicide, the sociologist Emile Durkheim (1951) distinguished three forms of suicide on the basis of etiological differences. A sense of normlessness, very low social integration and very high social integration he saw as the causes of anomic, egoistic and altruistic suicides respectively. Similarly, we have distinguished injury from assault on the basis of etiologic differences – assaults involved intention on the part of another

human being (a patient), while injuries did not. Thus although both categories of event are initiated by sudden release of energy, injuries and assaults were seen as having very different vehicles for the delivery of energy, and were analyzed separately for investigation of their determinants.

Physical Exposures and Risk

The frequency of patient lifting was found to be an important predictor of injuries. This risk was primarily observed among the CNAs, who do the bulk of the lifting, according to staff interviews. Combative behavior by the residents was a predictor of assaults, and this too was primarily observed among the CNA staff (Chapter 2). To illustrate these associations, the models predicted that a staff member (both nurses and CNAs) performing 55 lifts per shift (the 85^{th} percentile of the lifting distribution) had four times the risk of injury of someone performing just 4 lifts per shift (the 10^{th} percentile of the lifting distribution). Similarly, a staff member who experienced 20 combative events per shift (the 85^{th} percentile of the combative events distribution) had more than five times the risk of reporting an assault than someone with just one combative event per shift (again the 10^{th} percentile of the distribution).

The two dimensions of resident contact that were measured -- lifting residents and interacting with combative residents were correlated ($r = 0.85$). Thus it was not surprising that either of these dimensions, alone, predicted both injuries and assaults. But regression models did demonstrate what would appear to be separate effects. The lifting exposure predicted injuries while greater combativeness predicted assaults. This suggests that the measurement of these variables by asking staff members how

many lifts are required of the residents under their care and how combative the residents tend to be, and applying multipliers based on workers' assessment of differences in work routines by shift, was a useful method of assessing the physical demands required. It was unfortunate that we were not able to validate these measures, either with direct observation of lifting activities, or with questionnaires (there were only 41 completed questionnaires in which physical exposure data were available). If validated, this approach might be useful in future research when there are limited resources for the measurement of physical demands in long-term healthcare settings. However, rather than gathering this information from first shift workers only and applying multipliers to adjust for shift, one should do this assessment three times with workers on each shift. Workers would be asked to describe each of the residents' needs on an average day for their respective shift. This would improve the precision and validity of the multipliers.

We observed an interaction between physical demands and job title (Chapter 3). The lifting demands did not predict injuries among nurses as it did among CNAs. Nor did the residents' hostility predict the risk of assault to nurses as it did among CNAs. Since patient/resident handling is known to be a major contributing factor to the high injury rates among healthcare workers (Garg and Owen, 1994; Jensen, 1985; Kaplan and Deyo, 1988; Smedley, *et al*, 1995; Stobbe, *et al*, 1988; Pheasant and Stubbs, 1992) these findings may reflect an insufficient measurement of these exposures among nurses.

Culture and Social Networks

The purpose of this study was to explore the role of informal social relations at the workplace in the risk of workplace injuries and assaults. It was hypothesized that workers who were integrated would get more help from coworkers that would help them stay safe at the workplace. The sociometric methods that were proposed for evaluating the density of help and friendship networks required fairly complete survey coverage, and this proved impossible in this facility. We made several different attempts to survey the workforce. The facility's management was very cooperative, providing release time, as well as announcing and encouraging the effort. Training sessions on safety were provided as an inducement and a way to raise interest in the activity. A contest with a substantial cash prize was also organized for those who completed a survey. After the initial attempts were frustrating, we substantially shortened the instrument. Despite all these efforts, completed questionnaires were received from a total of 95 workers: 44 workers completed the first, long survey, 73 completed the shorter form (22 workers completed both). With these limited data, it was not surprising that we observed little evidence that friendship and help networks were associated with injury or assault risk.

Faced with inadequate survey data, investigations were undertaken to develop measures of "familiarity" that could be evaluated without individual survey information. It was hypothesized that working with familiar coworkers means that one knows the routines of others and so can better coordinate actions than if working persons unfamiliar to them. This hypothesis was rooted in the sociological work of

Peter Blau who argued that repeated interactions between individuals leads to greater cohesion among group members (Blau, 1960). Similarly, Simmel (1956) stated that repeated interactions lead to greater likelihood of agreements among individuals and Gouldner (1960) theorized that greater reciprocity occurs among individuals who have had repeated interactions over time. Jablin (2001) asserts that new members of a workplace go through a socialization *process* during which they learn norms and formal and informal rules of the workplace through interacting with other peer workers, mentors and supervisors. Robbins (1994) states that time spent together and physical proximity are important determinants of group cohesiveness. The more individuals interact with other group members, the greater the extent to which they become part of the group and are subject to its norms and expectations. This perspective was adapted to this study to support the notion that repeated interactions among coworkers, seen in staffing records, indicated a greater connectedness to the group.

Using only work rosters, it was possible to identify which workers were consistently present on any given floor and shift. These data were used to create two related variables, one dynamic and one fixed (Chapter 3). The “workgroup regular” variable was dynamic – it indicated for each workday of each worker whether or not he/she was working on a floor and shift where he/she regularly worked (the definition of regular was present for five out of the most recent seven times the worker appeared in the work roster data). The “primary workgroup” variable was fixed, and each participant either was or was not a primary workgroup member for the entire study

period. This latter definition was set so that anyone who worked at least 50% of the time on a regular floor and shift was designated a primary workgroup member.

The analyses of injuries and assaults to nurses and CNAs showed that workers were at an increased risk of injury and assault while working on the floor and shift they worked regularly (for injury OR = 1.7, 95% CI 1.0, 2.7, for assault OR = 2.0, 95% CI 1.3, 3.2). These associations remained after controlling for group-level physical exposures including resident lifting and hostility, and previous injuries and assaults (for injury OR = 1.5, 95% CI 0.9, 2.4, for assault OR = 1.8, 95% CI 1.1, 2.9). Workers who were not regular members of a workgroup were at *lower* risk of both assault and injury. This group included both those who were working on a floor or shift that was not that person's regularly assigned floor and those who were new hires, without sufficient time on the job to become a regular member of any workgroup.

Familiarity, which one might hypothesize would be associated with social support, was not protective of workers, but indeed *increased* their risk. This rather surprising finding, if supported by future studies, suggests that social integration may do more than protect workers. On the basis of these findings, we have hypothesized that being socially integrated into a workgroup can subject a worker to the norms of the group, which put its members at risk of injury and assault by demanding they do more than their share of care for the residents. Because of chronic short staffing and the serious physical and psychological needs of almost every resident, the level of care demanded by the workgroup may often exceed the physical and emotional

abilities of the staff. Those who are not workgroup regulars, by contrast, are at a relatively lower risk of injury or assault perhaps because they are not subjected to the same expectations regarding care for the residents.

The increased risk among workgroup regulars was observed only among the nurses. We speculate that this may reflect increased physical demands that regular workgroup nurses take upon themselves as a result of the expectations of their regular workgroup coworkers. The culture of professionalism among nurses, and their view of their jobs as putting the care of residents before care of themselves may be driving the highly integrated nurses to take on greater workloads, putting themselves at higher risk of injury and assault.

These unexpected results may not be merely an anomaly or an artifact of the data. Rather, we think the significance of social relations at the workplace was under-theorized when the original hypotheses were stated. We believe we focused too heavily on the mere presence of connections without considering the cultural setting in which these connections exist. In particular, we think the culture of caring that exists in the ethos of the nursing profession (Melosch, 1982, Reverby, 1987) led integrated individuals to put themselves at risk by providing more care for their residents than the less integrated workers. We also speculate that repeated interactions with residents may have led to a bonding between staff members and the residents for whom they provided care. These social bonds may have led the caregivers to be more attentive to their residents than those who did not have any meaningful connections with those under their care. This greater attentiveness, we

hypothesize, led to the observed increase in risk of assault among all staff members. The shared social meaning of providing care among workgroup regulars, developed through repeated encounters with coworkers and residents may partially explain the elevated risks of injury and assault among workgroup regulars.

The notion that culture and other social contexts are important modifiers of the significance of social connections has been well described in other settings, in the sociological literature. For example, regarding promotions at work, the relevance of one's social position in a workgroup was modified by one's gender and one's tenure (Burt, 1992). When looking for a job, those with high status benefit from both close personal ties and "weak" ties in which there is no close personal relationship, while those with low status benefit only from "weak" ties (Granovetter, 1973). These contingencies demonstrate the broader perspective one must have when considering the importance of social integration. In addition, social integration is not always beneficial. For example, research has shown that peer pressure can lead to smoking behavior (Vries, *et al*, 1995), drug abuse (Farrell and White, 1998), and high-risk sexual behavior (Santor, *et al*, 2000). Friends who are risk takers may draw others into the same risky behaviors or impose upon others the consequences of their risky behavior (Yager, 2002). It may be that, in our study population, being integrated leads one to take risks more than those who are less integrated. The cultural context, which may reward individuals for this dangerous behavior with acceptance and status, was not considered at the outset of this study.

Future Research Recommendations

Additional research on the subject of worker social integration and informal relations at the workplace should take into account the meaning of work as defined by the culture of the workplace(s). If studying a single workplace, this would mean adding items to surveys, questioning individuals during interviews, or conducting ethnographic surveys.

The poor survey response in this research suggests a clinic based case-control study may be a more efficient way of gathering data. In this approach, one could obtain information on a subject's ties to others at the workplace as well as the subject's image of the ties among his/her coworkers. In sociometric language, this is referred to as the subject's "ego-centered" network (Wasserman and Faust 1995). One advantage of this would be that many workplaces and many different social networks could be measured and analyzed. One disadvantage may be the difficulty in accounting for cultural dimensions of each workplace.

Additional study of the present data set may reveal important additional information. The remaining shift data which were not analyzed should be coded. Having these data available for further analysis would allow for a more precise measurement of the integration of the individual. First, it would negate the concern for the validity of the measurements based on the fact that we used a one-third sample of the data. Second, a more precise measure of integration could be generated. This might be the fraction of times in some fixed previous time interval in which the worker worked in a given workgroup, instead of the simpler dichotomous measure

(more or less than five of the seven previous times) that was used. This would allow for a categorization of workers as true "regulars", those who worked frequently but rotated floors and shifts constantly and those who did not become group members because they were new or did not work very often. In addition, the hypothesis that integration with residents explains the increased risk of assault could be tested. This would be done by creating a new variable that indicated working on a *floor* one usually works on regardless of which *shift* one is working. This would measure ties to residents but not workers. A more sophisticated measure of familiarity with one's coworkers could also be constructed. This would account for working with specific (named) individuals rather than using floor and shift as a proxy for a set of coworkers. Finally, these data could be used to generate levels of integration at the group level. If it is the social norm of caring that is behind the increase in risk of injury and assault, this may be explained by the cohesiveness of the entire group rather than the position of the individual. This could be explored with the remaining data.

Entering the remaining shift data would also allow for an assessment of risk using regression models appropriate for repeated measures. Generalized estimation equation models would be used to measure associations while controlling for bias produced by repeating measures on individual workers.

Additional research in this facility could also include an ethnographic analysis to see if our cultural hypotheses (professionalism of nurses, patient care before self-care, etc.) are supported. This would involve a good deal of observation of the care of residents. Interviews could also be done to get a sense of how nurses and CNAs

perceive the delivery of care and the risks involved. The existence of rewards and sanctions from the group in the form of status and acceptance would also be measured.

Policy Recommendations

Injuries--Resident lifting was shown to be a significant risk factor for injury in this study. This is consistent with the published literature (Garg and Owen, 1994; Jensen, 1985; Kaplan and Deyo, 1988; Stobbe, *et al*, 1988; Phesant and Stubbs, 1992), and is perhaps the best understood of all of the risk factors that we studied. These data, when combined with previous studies, suggest that resident lifting devices may reduce injuries in this facility. We also recommend more research on resident handling exposures and suggest that researchers be aware of the possibility that informal social relations at work and the culture of work may have a role in the distribution of these exposures within the workgroup.

Our findings on social integration do not lend themselves easily to policy recommendations. The quality of care delivered by workgroup regulars may well be higher than by non-regulars because they may go further in serving their residents. To be familiar with the residents may mean better care. To be integrated with one's coworkers also leads to better job satisfaction (Roberts & O'Reilly, 1979) and job satisfaction is linked to reduced absenteeism and turnover, which also play an important role in the quality of care (Myrtle and Robertson, 1979). These findings demonstrate some of the ways in which social cohesion among healthcare workers is tightly linked with nearly all aspects of the healthcare work environment. Much more

research would be needed before one could make recommendations that attempted to directly change worker social cohesion – either increasing or decreasing it – in the belief that this would improve safety at work.

At a minimum, though, it may be useful for administrators and staff members to discuss and learn about the norms of care and of helping that exist in the workplace. Simply making staff members aware of the risks associated with the culture of caring and the social rewards of sacrificing oneself may be a step to reducing injuries. Burnout is a well-described condition among caregivers, and it might be helpful in training for new employees that they are made aware of the potential hazards of offering too much of themselves. It may also be useful for safety practitioners to be aware that a workplace's culture can limit the effectiveness of their efforts to reduce safety hazards.

Assaults--It would seem prudent to recommend that workers who are assaulted repeatedly by the same resident be removed from caring for that resident. This might be beneficial if the recognition of the caregivers by the residents is part of the behavior that leads to the patient's combativeness. This may lead to a trade off in care since those who the residents know well may be more able to calm the residents than those with whom the residents are unfamiliar. However, it is not clear from our data whether rotating workers among residents would reduce overall assault rates, or if it would make assaults more evenly distributed among all staff members.

During interviews, staff members noted that weekends were "quieter" than weekday shifts. This is believed to explain the reduction in assaults observed on

weekends. This suggests that taking steps to make the residents feel more at ease would lead to a reduction in risk of assault to staff members.

Summary

The most important recommendation to make from this study is for more research on the roles of social factors such as group cohesion and the norms and values of workers in the etiology of injuries at work. This pilot study suggests that culture and social group dynamics may be putting individuals at an elevated risk of injury and assault. However, being a small study, these results must be heeded with caution. These results were not expected and must be corroborated in additional studies. In addition, the complexity of the social world must be respected when attempting to understand the importance of social contexts on injury, assault or any health outcome. In some settings, in or out of the workplace, the "right" culture and social environment may lead those who are integrated with such a culture to have lower risks of injuries and/or assault as was expected at the outset of this study. Much more research is needed in a variety of settings to understand how the social context affects and can be used to improve health.

LITERATURE CITED

1. Arnetz. J.E., Bengt, B. and Soderman, E. 1998. Violence Towards Health Care Workers: Prevalence and Incidence at a Large, Regional Hospital in Sweden. AAOHN. March, 46(3).

2. Blau, P.M. 1960. A Theory of Social Integration. Amer J of Sociology, Vol. 65, No. 6 (May), pp. 545-556

3. Burt, R.S. 1992. Structural holes: The social structure of competition. Cambridge, MA: Harvard University Press.

4. Durkheim, E. 1951. Suicide: a study in sociology. Free Press, New York

5. Farrell, A.D. and White, K.S. 1998. Peer influences and drug use among urban adolescents: family structure and parent-adolescent relationship as protective factors. Jof Consulting and Clin Psych. v 66 no2 Apr. p. 248-58

6. Garg A. and Owen B. 1994. An ergonomic approach to preventing back injuries from patient lifting. PTSM Series 2:15-22.

7. Gouldner, A. 1960. The norm of reciprocity. American Sociological Review. 25:161-178.

8. Granovetter, M. 1973. The strength of weak ties. American Journal of Sociology, 78: 1360-1380.

9. Jablin, F. M. 2001. Organizational entry, assimilation, and disengagement/exit. In F. M. Jablin & L. L. Putnam (Eds.), The new handbook of organizational communication: Advances in theory, research, and methods (pp. 732-818). Thousand Oaks, CA: Sage.

10. Jensen R.C. 1985. Events that trigger disabling back pain among nurses. Proceedings of the Human Factor Society-29th Annual Meeting: 799-801.

11. Kaplan R.M. and Deyo R.A. 1988. Back pain in health care workers. Occupational Medicine: State of the Art Reviews 3(1):61-73.

12. Melosh B. 1982. 'The physician's hand': Work culture and conflict in American nursing. Temple University Press, Philadelphia.

13. Myers D., Silverstein, B. and Nelson N. 2002. "Predicting Shoulder and Back Injuries in Nursing Home Workers: A Prospective Study". American Journal of Industrial Medicine, 41, 466-476.

14. Myrtle R.C. and Robertson J.P. 1979. Determinants of job satisfaction in nursing care units. Long Term Care Adm. Winter;7(4):17-29

15. Pheasant S, Stubbs D. Back pain in nurses: epidemiology and risk assessment. Appl Ergonomics 1992 23:226-232.

16. Reverby S.M., 1987. Ordered to care: The dilemma of American nursing, 1850–945. Cambridge University Press, Cambridge.

17. Robbins S. P. 1994. Essentials of Organizational Behavior. Prentice Hall, New Jersey.

18. Roberts, K.H., & O'Reilly, C.A. III. 1979. Some correlates of communication roles in organizations. Academy of Management Journal, 22: 42-57.

19. Santor, D.A., Messervey, D. and Kusumakar, V. Measuring peer pressure, popularity, and conformity in adolescent boys and girls: predicting school performance, sexual attitudes, and substance abuse J of Youth and Adolescence. No 2, April, p 163-182.

20. Simmel, G. 1950. The sociology of Georg Simmel, translated and edited by Kurt H. Wolff. Free Press, Glencoe. Ill.

21. Smedley J., Egger, P., Cooper, C. and Coggon, D. 1995. Manual handling activities and risk of low back pain in nurses. Occupational and Environmental Medicine. 52;160-63.

22. Stobbe T.J., Plummer R.W., Jensen R.C., Attfield M.D. Incidence of low back injuries among nursing personnel as a function of patient lifting frequency. J Safety Res 1988 19:21-28.

23. Vries, H de, Backbier, E and Kok, G. 1995. The impact of social influences in the context of attitude, self-efficacy, intention, and previous behavior as predictors of smoking onset. J of Applied Social Psychology. Vol 25 Feb, p. 237-57

24. Wasserman, S., & Faust, K. 1994. Social network analysis: Methods and applications. Cambridge University Press, New York.

25. Yager, Y. 2002. When friendship hurts: how to cope with friends who betray, abandon, or wound you. Simon & Schuster, New York.

ACKNOWLEDGEMENTS

The investigators acknowledge the far-sighted willingness of the administrators of the healthcare facility for the considerable time and effort they expended to help with this research. We also thank the many staff members of the facility who gave willingly of their time.

We also thank the colleagues who assisted with the design and analysis phases of the study: professors David Wegman, Laura Punnett and Robert Karasek of the University of Massachusetts Lowell, and Professor Nicholas Warren of the University of Connecticut.

APPENDIX A

Survey Questionnaire – Long Version

WORKPLACE HAZARD QUESTIONNAIRE

1. What is your name? _____

2. What is your Age _____ Sex _____

   Marital Status ☐ Single ☐ Married ☐ Divorced ☐ Widowed

3. What is your education? (highest grade completed—*please check one*)

   ____Elementary School
   ____Junior High (8th and 9th grade)
   ____High School
   ____Junior College (1-2 yrs of college)
   ____College Graduate
   ____Graduate School

4. What is your job title? (*Please be specific. For example, if you are a "Med Nurse", please say "Med Nurse" and not just "Nurse" or "LPN". If, for example, you are a Psychiatric CNA, please say so.*)_____

5. How long have you worked in this job position (*please include time you may have worked for other employers*)._____

6. How many hours per week do you work (*please include the time you spend on all jobs you have*).

   _____hours per week.

7. Do you have a spouse that works?

   ☐Yes ☐ No

   If YES, how many hours per week does your spouse work?

   _____hours per week

8. How many children do you have at home that are
   under 18 years of age?_____
   under 6 years of age?_____

9. Do you smoke cigarettes?
   Yes ☐ No ☐
   If YES, how much do you smoke?
   _____ pack(s) per day

FOR THE QUESTIONS BELOW, PLEASE CHECK THE BOX WITH THE ANSWER THAT COMES CLOSEST

10. My job requires that I learn new things.
    ☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

11. My job involves a lot of repetitive work.
    ☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

12. My job requires me to be creative.
    ☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

13. My job allows me to make a lot of decisions of my own.
    ☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

14. My job requires a high level of skill.
    ☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

15. On my job, I have very little freedom to decide how I do my work.
    ☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

16. I get to do a variety of different things on my job.
    ☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

17. I have a lot of say about what happens on my job.
    ☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

18. I have an opportunity to do develop my own special abilities.
    ☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

19. My job requires working very fast.
    ☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

20. My job requires working very hard.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

21. My job requires lots of physical effort.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

22. I am NOT asked to do an excessive amount of work.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

23. I have enough time to get the job done.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

24. I am often required to move or lift very heavy loads on my job.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

25. My work requires rapid and continuous physical activity.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

26. I am free from conflicting demands that others make.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

27. My job requires long periods of intense concentration on the task.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

28. My tasks are often interrupted before they can be completed, requiring attention at a later time.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

29. My job is very hectic.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

30. I am often required to work for long periods with my body in physically awkward positions.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

31. I am often required to work for long periods with my head or arms in physically awkward positions.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

32. Waiting on work from other people or departments often slows me down on my job.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

33. My supervisor is concerned about the welfare of those under her/him.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

34. My supervisors pay attention to what I am saying.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

35. My supervisor is helpful in getting the job done.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

36. My supervisor is successful in getting people to work together.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

37. I am exposed to hostility or conflict from my supervisor.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

38. People I work with are competent in doing their jobs.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

39. People I work with take a personal interest in me.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

40. People I work with are friendly.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

41. People I work with are helpful in getting the job done.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

42. I am exposed to hostility or conflict from people I work with.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

43. The people I work with encourage each other to work together.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

44. I am subject to the hostility or abuse from residents.
☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

45. How satisfied are you with your job overall?
☐ Not at All ☐ Not Too ☐ Somewhat ☐ Very

46. Would you advise a friend to take this job (here at this facility)?
☐ Advise Against ☐ Have Doubts About It ☐ Strongly Recommend

47. Would you take this job again (here at this facility)?
    ☐ Take Without Hesitation ☐ Have Second Thoughts ☐ Definitely Not

48. How likely is it that you will find a new job in the next year?
    ☐ Very Likely ☐ Somewhat ☐ Not at All

49. Is this job like what you wanted when you applied for it?
    ☐ Very Much ☐ Somewhat Like ☐ Not Very Muck Like

50. How steady is your work?
    ☐ Regular and steady ☐ Seasonal ☐ Frequent layoffs
    ☐ Both seasonal and frequent layoffs ☐ Other

51. My job security is good.
    ☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

52. Sometimes people permanently lose jobs they want to keep. How likely is it that during the next couple of years you will lose your present job with your employer?

    ☐ Not at all likely ☐Not too likely ☐ Somewhat likely ☐ Very likely

53. I find that caring for the residents is a very rewarding part of my job.
    ☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

54. I have grown emotionally attached to many of the residents under my care.
    ☐ Strongly Disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

FOR QUESTIONS 55 TO 58, PLEASE DESCRIBE HOW YOU HAVE FELT IN THE PAST TWO WEEKS:

55. I felt depressed.
    ☐ Hardly ever, never ☐ Some of the time ☐ Most of the time

56. I enjoyed life.
    ☐ Hardly ever, never ☐ Some of the time ☐ Most of the time

57. I was unusually tired in the morning.
    ☐ Hardly ever, never ☐ Some of the time ☐ Most of the time

58. At the end of the day, I am completely exhausted.
☐ Hardly ever, never ☐ Some of the time ☐ Most of the time

59. Please list the names of all coworkers (aides, nurses and managers/supervisors, including pool workers) you would ask for help when doing a physical task, such as lifting or restraining residents. If you would not ask anyone, please write "none." (reminder: all information you provide will be held confidential. Only the researcher will see your survey.)

_____ _____ _____
_____ _____ _____
_____ _____ _____
_____ _____ _____

60. Please list the names of all coworkers (Aides, Nurses, Managers/Supervisors including pool workers) you consider to be your friends. If you consider NONE of your coworkers to be friends, please write "NONE."

_____ _____ _____
_____ _____ _____
_____ _____ _____
_____ _____ _____

61. Whom do you go to when you are not sure about how to do a task at work? (Again please list the names of all relevant Aides, Nurses, Managers/Supervisors, including pool workers) If you go to do NOT go to ANYONE, please write "NONE."

_____ _____ _____
_____ _____ _____
_____ _____ _____
_____ _____ _____

62. Please list the names of all coworkers (Aides, Nurses, Managers/Supervisors, including pool workers) to whom you go for help or advice if you have a personal problem at work. If you do NOT go to ANYONE, please write "NONE."

_____ _____ _____
_____ _____ _____
_____ _____ _____
_____ _____ _____

63. **How often** do you skip or miss your SCHEDULED WORK BREAKS (including lunch)? (*please check one*)

__rarely or almost never
__infrequently (*less than once per month*)
__occasionally (*at least once per month*)
__sometimes (*at least once per week*)
__daily or almost daily

64. **How much time** during the workday, *on average*, do you perform tasks where you are ON YOUR FEET (standing and walking)? (*please check one*)

__ never or rarely
__ up to 2 hours/day
__ more than 2 but less than 4 hours/day
__ from 4 to 6 hours/day
__ more than 6 hours/day

65. Check the description below that best describes how you spend the ***majority*** of your work time ON YOUR FEET: (*please check one*)

___ standing in one place (*like a grocery cashier*)
___ walking short distances (*less than about 20 feet*)
___ walking distances greater than 20 feet
___ nearly equal mixture of walking distances less than and greater than 20 feet
___ nearly equal mixture of standing and walking

66. **How many times** during the day, *on average*, do you perform tasks where you are kneeling or squatting?

___none
___1 to 5 times per day
___6 to 10 times per day
___11 to 20 times per day
___21 to 50 times per day
___51 to 100 times per day
___more than 100 times per day

67. **How many times** during the workday, *on average*, do you perform tasks where you PUSH or PULL objects with about 20 pounds of force or more (such a resident in a wheelchair, a fully loaded meal cart and so on)?

___none
___1 to 5 times per day
___6 to 10 times per day
___11 to 20 times per day
___21 to 50 times per day
___51 to 100 times per day
___more than 100 times per day

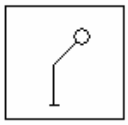
68. How often do you have PROBLEMS with equipment or parts that result in your having to use MORE FORCE to complete your job? (*please check one*)

___ never
___ infrequently
___ occasionally
___ sometimes
___ daily or almost daily

69. Which statement below best describes the TYPICAL MOVEMENT OF YOUR HANDS AND ARMS while working? (*please check one*)

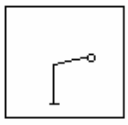
___ no regular motion; hands and arms mostly idle
___ slow steady motion; frequent pauses
___ steady motion; occasional pauses
___ rapid steady motion; no regular pauses
___ rapid steady motion; difficulty keeping up

70. **How many times** during the workday, *on average*, do you perform tasks such as LIFTING or REACHING where you BEND FORWARD at the waist SLIGHTLY (20 to 45 degrees), as shown in the picture? (Note: this drawing is a SIDE VIEW of a person bending.)



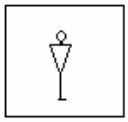
___none
___1 to 10 times per day
___11 to 50 times per day
___51 to 100 times per day
___101 to 150 times per day
___151 to 200 times per day
___201 to 250 times per day
___more than 250 times per day

71. **How many times** during the workday, *on average*, do you perform tasks such as LIFTING or REACHING where you BEND <u>FAR</u> FORWARD at the waist, as shown in the picture? (Note: this drawing is a SIDE VIEW of a person bending)



___none
___1 to 10 times per day
___11 to 50 times per day
___51 to 100 times per day
___101 to 150 times per day
___151 to 200 times per day
___201 to 250 times per day
___more than 250 times per day

72. **How many times** during the workday, *on average*, do you perform tasks where you TWIST YOUR BACK, as shown in the picture? (Note: this drawing is a SIDE VIEW of a person twisting at the waist).



___none
___1 to 10 times per day
___11 to 50 times per day
___51 to 100 times per day
___101 to 150 times per day
___151 to 200 times per day
___201 to 250 times per day
___more than 250 times per day

73. **How many times** during the workday, *on average*, do you perform tasks where you BEND TO THE SIDE at the waist (left or right), as shown in the picture? (Note: this drawing represents a FRONT view of a person)

___none
___1 to 10 times per day
___11 to 50 times per day
___51 to 100 times per day
___101 to 150 times per day
___151 to 200 times per day
___201 to 250 times per day
___more than 250 times per day

74. For question 74, please think of all the RESIDENT handling you do: to and from beds, chairs, toilets, bathtubs, the floor, etc.

A. *On average*, how many times per day TOTAL do you lift RESIDENTS?

___none
___1 to 10 times per day
___11 to 50 times per day
___51 to 100 times per day
___101 to 150 times per day
___151 to 200 times per day
___201 to 250 times per day
___more than 250 times per day

B. *On average*, how many times per day, *on average*, do you lift RESIDENTS while using LIFTING/TRANSFER DEVICES?

___none
___1 to 5 times per day
___6 to 10 times per day
___11 to 20 times per day
___21 to 50 times per day
___51 to 100 times per day
___more than 100 times per day

C. *On average,* how many times per day do you lift RESIDENTS while they are acting violently (for example, flailing and thrashing about)?

___none
___1 to 10 times per day
___11 to 50 times per day
___51 to 100 times per day
___101 to 150 times per day
___151 to 200 times per day
___more than 200 times per day

D. *On average*, how many times per day do you lift residents who CANNOT ASSIST in the transfer?

___none
___1 to 10 times per day
___11 to 50 times per day
___51 to 100 times per day
___101 to 150 times per day
___151 to 200 times per day
___201 to 250 times per day
___more than 250 times per day

75. How many times during the workday, *on average*, do you perform tasks where you LIFT objects that weigh 10 pounds or more *other than residents* (this would include things like laundry bags, linen packs and furniture but NOT RESIDENTS)?

___none
___1 to 5 times per day
___6 to 10 times per day
___11 to 20 times per day
___21 to 50 times per day
___51 to 100 times per day
___more than 100 times per day

76. How many times during the workday, *on average*, do lift residents' charts to or from the shelf

___none
___1 to 5 times per day
___6 to 10 times per day
___11 to 20 times per day
___21 to 50 times per day
___51 to 100 times per day
___101 to 150 times per day
___more than 150 times per day

77. What statements below best describe your most typical body motion when LIFTING objects at work? (*please check **ALL** that apply*)

__ reaching above shoulder height
__ reaching in front of the body
__ bending forward at the waist
__ twisting at the waist
__ carrying objects at least 10 feet
__ lift at least 1 to 5 times per minute
__ one-handed lift
__ lift unstable loads with shifting weight

78. Please rate the OVERALL physical effort level demanded by your job. (*please check one*)

__ very hard __ hard __ moderate __ fairly light __ very light

79. How much does your work vary from day to day? (*please check one*)

__ there is no variation; I do the same thing each day
__ there is a little variation from day to day
__ there is a considerable amount variation from day to day
__ there is a great deal of variation; I do different things every day

80. Have you been injured on the job within the past two months? (*please check one*)

____Yes ____No

If YES, please provide information about the injuries in the space below. There is space for up to three past injuries. If NO, please go to question 81.

Injury #1

Please describe the injury (sprain, bruise, cut, etc):_____

Body part injured:_____

How did the injury happen: _____

_____

How much time off from work did you take due to this injury?

☐ None ☐ Less than 1 day ☐ 1 Day
☐ 2 to 5 Days ☐ More than 5 Days

Did you report this injury to your supervisor? ___Yes ____No

Injury #2

Please describe the injury (sprain, bruise, cut, etc):_____

Body part injured:_____

How did the injury happen: _____

_____

How much time off from work did you take due to this injury?

☐ None ☐ Less than 1 day ☐ 1 Day
☐ 2 to 5 Days ☐ More than 5 Days

Did you report this injury to your supervisor? ___Yes ____No

Injury #3

Please describe the injury (sprain, bruise, cut, etc):_____

Body part injured:_____

How did the injury happen: _____

_____

How much time off from work did you take due to this injury?

☐ None ☐ Less than 1 day ☐ 1 Day
☐ 2 to 5 Days ☐ More than 5 Days

Did you report this injury to your supervisor? ___Yes ____No

81. Please describe what you feel are the most dangerous parts of your job.

_____
_____
_____
_____

82. DO YOU HAVE **ANYTHING TO ADD** TO THIS QUESTIONNAIRE?

_____
_____
_____
_____

APPENDIX B

Survey Questionnaire – Short Version

WORKPLACE HAZARD QUESTIONNAIRE

1. What is your name? _____

2. What is your Age _____ Sex _____

3. What is your education? (highest grade completed—*please check one*)

   ____Elementary School ____Junior College (1-2 years of college)
   ____Junior High (8th and 9th grade) ____College Graduate
   ____High School ____Graduate School

4. What is your job title? (*Please be specific. For example, if you are a "Med Nurse", please say "Med Nurse" and not just "Nurse" or "LPN". If, for example, you are a Psychiatric CNA, please say so.*)_____

5. How long have you worked in this job title (*please include time you may have worked for other employers*)._____

6. How many hours per week do you work (*please include the time you spend on all jobs you have*).

   _____hours per week.

7. Do you smoke cigarettes? ☐Yes ☐ No

   If YES, how much do you smoke? _____ pack(s) per day

8. Please list the names of all coworkers (Aides, Nurses and Managers/Supervisors, including pool workers) you would ASK FOR HELP WHEN DOING A PHYSICAL TASK, such as lifting or restraining residents. If you would NOT ask ANYONE for this kind of help, please write "NONE." If you would go to anyone available for this kind of help, please simply write "ANYONE." (REMINDER: ALL information you provide will be held completely CONFIDENTIAL. Only the researcher will see your survey.)

_____ _____ _____
_____ _____ _____
_____ _____ _____
_____ _____ _____

9. Please list the names of all coworkers (Aides, Nurses and Managers/Supervisors, including pool workers) you consider to be your FRIENDS. If you consider NONE of your coworkers to be friends, please simply write "NONE."

_____ _____ _____
_____ _____ _____
_____ _____ _____
_____ _____ _____

10. Please list the names of all coworkers (Aides, Nurses and Managers/Supervisors, including pool workers) you would ASK FOR ADVICE IF YOU WERE NOT SURE ABOUT HOW TO DO A TASK at work? If you would NOT go to ANYONE for this kind of help, please write "NONE." If you would go to anyone available for this kind of help, please simply write "ANYONE."

_____ _____ _____
_____ _____ _____
_____ _____ _____
_____ _____ _____

11. For the next set of questions, we ask you about how often you do tasks compared to how often others in your workgroup do the same tasks. Please compare yourself with others who have the SAME GENERAL JOB TITLE that you have (either other CNAs or other Nurses) and who USUALLY work on the SAME FLOOR and SHIFT that you work on MOST OF THE TIME. If you work on different floors and/or different shifts from day to day, please do your best to compare yourself to ALL OTHERS with the same job title in general that you have.

    a. Compared to other people with your job title who usually work on the same floor and shift that you usually work on, how much LIFTING RESIDENTS do you do?

☐ A lot more ☐ A little more ☐ About the same ☐A little less ☐ A lot less

    b. Compared to other people with your job title who usually work on the same floor and shift that you usually work on, how much WORKING WITH HOSTILE or COMBATIVE RESIDENTS do you do?

☐ A lot more ☐ A little more ☐ About the same ☐A little less ☐ A lot less

    c. Compared to other people with your job title who usually work on the same floor and shift that you usually work on, how much LIFTING or MOVING THINGS OTHER THAN RESIDENTS (for example, loaded carts, or laundry bags, etc.) do you do?

☐ A lot more ☐ A little more ☐ About the same ☐A little less ☐ A lot less

12. Do you usually ☐ Work the SAME floor and shift from day to day
☐ Work on DIFFERENT floors or shifts from day to day

13. Please describe what you feel are the MOST DANGEROUS parts of your job.

_____
_____
_____
_____

14. Do you have **ANYTHING TO ADD** to this questionnaire?

_____
_____
_____

Publications

Myers, D., Kriebel, D., Karasek, R., Punnett, L, & Wegman, D. (2004, submitted). Rates of work-related acute injuries and physical assaults among healthcare workers in a long-term psychiatric and medical facility. *AAOHN J*.

Myers, D., Kriebel, D., Karasek, R., Punnett, L, & Wegman, D. (2004, submitted). Social connectedness among healthcare workers in a long-term psychiatric and medical facility and risk of work-related acute injury and physical assault. *Soc Sci Med.*