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## The Impact of Physical and Psychosocial Factors on Workplace Injuries in Nursing Assistants

Colleen Roberts  
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Colleen Roberts, Student

Steve Browning, PhD, Committee Chair

Linda Alexander, EdD, Director of Graduate Studies

**THE IMPACT OF PHYSICAL AND PSYCHOSOCIAL FACTORS ON  
WORKPLACE INJURIES IN NURSING ASSISTANTS**

CAPSTONE PROJECT PAPER

A paper submitted in partial fulfillment of the  
requirements for the degree of  
Master of Public Health  
In the  
University of Kentucky College of Public Health  
By  
Colleen Catherine Roberts, BS

Lexington, Kentucky

April 22<sup>nd</sup>, 2015

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## ABSTRACT

**Objective:** The objectives of this study were to 1) Describe the nature and prevalence of workplace injuries in nursing assistants (NAs) and 2) Assess the impact of physical and psychosocial work factors on the occurrence of back injuries and muscle strains in these nursing assistants.

**Methods:** Data for this study are from the 2004 National Nursing Assistant Survey (NNAS), which was conducted as a supplement to the National Nursing Home Survey (NNHS). The original dataset contained 3,017 records. The data were analyzed as a case-control for this study's purpose. Cases were defined as participants who had experienced a back injury or another pulled or strained muscle in the preceding 12 months (n=714). Controls were defined as participants who had not experienced any injury in the preceding 12 months (n=1141). Logistic regression was used to estimate the effect of physical and psychosocial work factors on case status, as well as controlling for possible confounders.

**Results:** The majority of the NAs reported at least one injury in the last year, with only 40.6% reporting no injuries. The most commonly occurring injuries were wounds (45.1%), followed by bruising (19.3%) and back injuries (17%). NAs were most frequently injured due to resident aggression (59.7%) and from lifting, handling, or bathing a resident (50.0%). NAs who responded that they did not have enough time to complete activities were more likely to have suffered a back or muscle injury (OR=2.19, 95% CI= 1.79-2.69). Job satisfaction was significantly associated with outcome status; cases were more likely to report being somewhat and extremely dissatisfied with their current job (chi-square<sub>df3</sub>=158.73, P=<0.001). Controlling for all variables through

logistic regression, not having enough time to complete activities (OR=1.43, 95% CI: 1.13-1.82), mandated overtime (OR=1.47, 95%CI: 1.11-1.94), having the facility provide training on preventing work injuries (OR= 0.65, 95% CI: 0.44-0.97), and being extremely dissatisfied with the job (OR= 5.36, 95% CI: 2.92-9.83) were significantly associated with experiencing a back or muscle injury.

**Conclusion:** Both physical and psychosocial factors were found to impact the likelihood of a nursing assistant experiencing a back injury or a muscle strain in the preceding 12 months. With 40% of the study population experiencing an injury in the preceding 12 months, this study provides evidence that improvements are needed to reduce injuries in nursing assistants, particularly as the need for long-term care services is increasing.

## INTRODUCTION

Long-term care services make up a significant portion of the healthcare system in the United States by providing personal care and supportive services to older adults whose ability for self-care is limited<sup>1</sup>. The need for long-term care services is projected to double by 2050 due to life expectancy increases and the aging of the baby boomer generation<sup>2</sup>. As a result of this, the number of healthcare personnel (HCP), such as nursing assistants or nursing aides, home health aides, and personal care aides in the long-term care sector is projected to grow to between 5.7 to 6.6 million by 2050<sup>3</sup>.

Certified nursing assistants (CNAs) provide 80% to 90% of nursing home care and are the foundation of the nursing home workforce; however, turnover rates in CNAs are as high as 400%<sup>4</sup>. According to the Bureau of Labor Statistics<sup>5</sup>, the overall injury rate for nursing assistants is second among all industries, which makes being a nursing assistant among the most hazardous jobs in the United States<sup>6</sup>. The most common injury that NAs experience is musculoskeletal disorders (MSDs), typically as a result of patient handling<sup>7,8</sup>. To meet the increasing demand for long-term care services, nursing homes need to improve retention rates and reduce injury rates in nursing assistants.

How to most effectively reduce injury rates has been an area of growing interest in the last few years. Some studies have focused on lifting techniques and engineering controls to reduce back injuries, while other studies have shown that injury rates are associated with psychosocial factors, such as supervisor support. This study attempts to fill a literature gap by examining both physical and psychosocial factors associated with musculoskeletal injuries experienced by nursing assistants by using data from the 2004

National Nursing Assistant Survey. The objective of this study was first to describe the nature and prevalence of workplace injuries in nursing assistants and then to assess the impact of physical and psychosocial works factors on the occurrence of back injuries and muscle strains in these nursing assistants.

## **LITERATURE REVIEW**

### *Long-Term Care Services*

Long-term care services make up a significant portion of the healthcare system in the United States by providing personal care and supportive services to older adults whose ability for self-care is limited<sup>1</sup>. Long-term services and supports (LTSS) are defined as assistance with activities of daily living (ADLs), including bathing, dressing, eating, transferring, walking and instrumental activities of daily living (IADLs), including meal preparation, money management, house cleaning, medication management, transportation<sup>2</sup>. The ultimate goal of long-term care (LTC) is to assist people in maintaining or improving an optimal level of physical functioning and quality of life. The settings in which an individual can receive services include nursing homes, assisted living facilities, other residential and community-based care settings, and private residences<sup>9</sup>. The diversity of the setting in which LTSS are provided is reflective of the diversity of the population served.

Over 12 million Americans use LTSS and those individuals are a diverse group in terms of age, and their conditions<sup>2</sup>. Individuals who rely on LTSS could be receiving these services because of a chronic illness; injury; physical, cognitive, or mental disability; or other health-related conditions<sup>1,2,10</sup>. Of the total population who rely on



LTSS, 56% are age 65 and older, which still leaves nearly 5 million adults of working age that require these services<sup>10</sup>. Working age adults are most likely to suffer from intellectual disabilities, paralysis and nervous system disorders; adults age 45-64 are most likely to suffer from physical disabilities and adults age 65 and older are most likely to suffer from physical functional impairments and cognitive impairment, such as dementia and Alzheimer's<sup>2</sup>. Long-term care services are a vital part of this country's healthcare system and will only become increasingly more important as the aging population becomes larger and the healthcare paradigm continues to shift away from the traditional acute care system<sup>1,2,10</sup>.

The need for long-term care services is projected to double by 2050 due to life expectancy increases and the aging of the baby boomer generation<sup>2</sup>. The use of long-term care and the staff needed to deliver that care will increase when the baby boomer generation starts to reach age 75 in 2021<sup>2</sup>. The numbers are predicted to increase even more sharply around 2030 when the baby boomer generation starts to reach 85<sup>2</sup>. Not only will the number of individuals who rely on LTSS increase, but the number of nursing homes and assisted living facilities will need to increase in order to accommodate this need. As a result, the number of healthcare personnel (HCP), such as nursing assistants or nursing aides, home health aides, and personal care aides in the LTC sector is projected to grow to between 5.7 to 6.6 million by 2050<sup>3</sup>.

### *Long-Term Care Workforce*

In 2009, there were 4.7 million individuals employed by LTC and approximately 61% of these employees made up the direct care workforce in institutional LTC

settings<sup>10</sup>. Direct care workers fall into three main categories: nursing assistants, home health aides, and personal care aides<sup>11,12</sup>. Nursing assistants (NA) mostly work in nursing homes; however, some do work in assisted living facilities and other community-based settings<sup>11</sup>. NAs are responsible for assisting residents with ADLs and often performing clinical tasks, such as blood pressure readings and range of motion exercises<sup>11</sup>. Home health aides provide similar services as NAs, but do so in the home of a client and under supervision from a licensed nurse or therapist<sup>11</sup>. A personal care aide is an umbrella term that includes personal care attendants, home care workers, homemakers, and direct support professionals<sup>11</sup>. Personal care aides do assist with ADLs, but also help with medication management, housekeeping, and meal preparation<sup>11</sup>. The direct care workers have the most contact with the residents; therefore, they are the ones most likely to influence the quality of care and quality of life of the residents<sup>9</sup>. Nursing assistants have the most responsibility in nursing homes and the importance of their role in the residents' every-day life is often not commensurate with the required training and education that is provided to them<sup>13</sup>.

The federal requirement to be qualified for a NA position is 75 hours of initial training based on the guidelines established in the Nurse Aide Training and Competency Evaluation Program of the Omnibus Reconciliation Act of 1987<sup>13,14</sup>. The initial training course work is covered in just 2 weeks and the level of difficulty and detail of the material is hard to absorb in such a short time period<sup>13</sup>. Since its passing in 1987, the training requirements have not been changed<sup>13</sup>, despite the population being cared for and the LTC structure in United States has changed drastically over the last two decades. In 2008, the Paraprofessional Healthcare Institute (PHI)<sup>15</sup> called for a change in the

education and training provided to NAs as the existing guidelines are outdated, ineffective and do not meet the needs of the elderly population today.

Poor training and education will create a deficit in the number of competent and qualified workforce at a time when the demand for these workers is growing exponentially<sup>11,13,15</sup>. It is projected that the need for nursing assistants will grow by nearly 50%, closing in on almost 2 million workers in order to meet the need of today's elderly population<sup>10,11</sup>. These workers directly affect the quality of care provided to residents and if the supply of NAs cannot meet the demand, quality of care will suffer. In order to maintain quality of care, nursing homes need to retain existing nursing assistants, which has proven difficult as inadequate training systems have led to high stress and consequently, high turnover rates<sup>16,17</sup>.

### *Nursing Assistant Characteristics*

Certified nursing assistants (CNAs) provide 80% to 90% of nursing home care and are the foundation of the nursing home workforce; however, turnover rates in CNAs are as high as 400%<sup>4</sup>. The work of a CNA is documented as quite stressful and is characterized as physically demanding<sup>4,18,19</sup>. NAs are also chronically underpaid; the 2012 median pay for NAs was \$24, 000 or roughly \$11.00 an hour<sup>12</sup>. As a result of the increasing demand for NAs, recent research has sought to explore the reasons behind high turnover rates and to attempt to increase the understanding of NAs as an occupational group. NA turnover often results in replacement costs, lost productivity, compromised quality, and lowered morale<sup>17,19-21</sup>. It has become a major policy priority to

improve retention rates, but in order to prevent high turnover and attrition, it is imperative to understand why NAs leave.

Turnover in CNAs is higher than other professions within the long-term care continuum<sup>22</sup>. Research investigating explanations to this phenomena include, job satisfaction, job stress, supervisor support, and organizational factors.<sup>4,9,11,13,14,17-21,23</sup> Organizational factors include low pay, limited benefits and opportunity for promotion, poor employee engagement and an overall lackluster working environment<sup>19</sup>. NAs are chronically underpaid for the nature of the work that they perform; 45% live in households earning below 200% of the federal poverty level income<sup>11</sup>. Approximately, 46% of NAs are eligible for publicly funded services such as Medicaid and 26% of people employed in nursing care facilities do not have health insurance<sup>10-12</sup>. While factors such as, the low pay, staffing ratios, and absentee policies, are frequently cited throughout the literature, NAs report that the way they are treated acted as more significant motivation to stay or leave<sup>4,18,20</sup>.

Secrest, Iorio, and Martz reported<sup>20</sup> the way the agency made them feel often accounted for NAs deciding to leave. NA's cited feeling, "dismissed or insignificant by the agency through agency policies and practices that did not, for example, recognize skill levels of NAs, or minimized an NA's role with specific residents by randomly floating the NA to another unit", as motivation for leaving<sup>20</sup>. Management seems to play a key role in maintaining NAs, as one study found a 10% increase in turnover among top management correlated with a 21% increase in the odds that a facility will have high NA turnover<sup>21</sup>. Additionally, agency characteristics, such as lower staffing levels, lower

quality, for-profit ownership, and higher bed size were associated with higher NA turnover<sup>17</sup>.

Job satisfaction is found to be inversely associated with a higher NA turnover rate<sup>24</sup>. Several studies have examined the factors that are correlated to job satisfaction. McGilton et al.<sup>24</sup> aimed to determine the significant predictors of job satisfaction through interviewing 220 CNAs across 10 LTC institutions in Ontario. The researchers found that job stress and supervisory support were predictors of job satisfaction. Job satisfaction is found to be increased when NAs feel empowered in the workplace and have a sense of value to the supervisory staff<sup>20</sup>. Pennington, Scott, and Magilvry<sup>4</sup> found CNAs in Colorado are motivated by factors such as job enrichment opportunities, personal growth opportunities, recognition, responsibility, and sense of achievement. Probst et al.<sup>22</sup> found organizational climate, supervisor behavior, sufficient time for tasks, and being valued were positively associated with job satisfaction. Similarly, a random sample of CNAs in Iowa cited leaving their job because their work environment was characteristic of excessive managerial control and task orientation<sup>18</sup>.

### *Occupational Injuries*

According to the Bureau of Labor Statistics<sup>5</sup>, the overall injury rate for nursing assistants is second among all industries, which makes being a nursing assistant among the most hazardous jobs in the United States<sup>6</sup>. The most common types of injuries that nursing assistants experience are injuries related to violence from the residents and musculoskeletal injuries<sup>5,6,8,25-27</sup>. Tak et al. reported that 34% of nursing assistants reported experiencing physical injuries from residents' aggression in the previous year<sup>27</sup>.

Mandatory overtime and not having enough time to assist residents with their ADLs was associated with injury risk, as well as working in an Alzheimer care unit<sup>27</sup>. Injury rates have also been found to be associated with nursing home organizational characteristics, including for-profit ownership, average occupancy, staffing patterns, and turnover of top management and registered nurses<sup>6</sup>. The most common injury that NAs experience is musculoskeletal disorders (MSDs), typically as a result of patient handling<sup>7,8</sup>.

MSDs are injuries or disorders of the muscles, nerves, tendons, joints, cartilage, and disorders of the nerves, tendons, muscles and supporting structures of the upper and lower limbs, neck, and lower back that are caused, precipitated or exacerbated by sudden exertion or prolonged exposure to physical factors such as repetition, force, vibration, or awkward posture<sup>28</sup>. Nursing assistants consistently suffer three to four times the number of back injuries as registered nurses<sup>25</sup>. Understanding the mechanism behind these injuries has become of particular interest in the recent years. The risk of these injuries is likely to increase due to expanding obesity rates in Americans and the associated challenge of moving these patients safely; the increase in the elderly population requiring LTC and the increasing age of the nurses themselves<sup>7</sup>.

In a postal survey mailed to randomly selected CNAs, half of the respondents reported that they had hurt themselves while lifting, moving, or helping a patient, and that the large majority of these injuries were to their backs<sup>7</sup>. Education and policies that offer consistent assistance to their employees were associated with a decline in the number of MSDs<sup>7</sup>. A survey of Ohio nursing homes found injury rate ratios increased with the proportion of residents using wheelchairs and were lower in smaller facilities<sup>8</sup>. The vast majority (95%) of the facilities had written resident lifting policies, but only 22% of these

were zero-lift policies; facilities without a lifting policy had a higher estimated injury rate than facilities without such a policy<sup>8</sup>. McCaughey et al. found injury rates in nursing assistants were associated with low job satisfaction, increased turnover intentions, and with NAs not likely to recommend their facility as a place to work<sup>16</sup>. It was also found that nursing assistant injury rates are related to employee ratings of injury prevention training, supervisor support, and employee engagement<sup>16</sup>.

The fact that nursing assistants are at an increased risk for injuries, particularly in regards to musculoskeletal disorders, is well-established in the scientific literature. Nonetheless, the risk of injury has not decreased over the years, rather the opposite is occurring. As the number of individuals relying on long-term care services is likely to double by 2050, the strain and risk of injury to nursing assistants will only grow higher. It is imperative that employers and the administrators of long-term care institutions understand the risk to their employees if changes are not made. Literature has focused on lifting techniques and engineering controls to reduce back injuries and studies have shown that when the appropriate patient handling equipment (such as hoists and lateral transferring devices) is used, the risk of MSD is significantly reduced<sup>29</sup>. However, other studies have shown that injury rates are associated with psychosocial factors, such as supervisor support. This has created a gap in the literature because studies have not examined the risk of injury while accounting for both physical and psychosocial factors. This research attempts to fill this gap by examining both physical and psychosocial factors associated with musculoskeletal injuries experienced by nursing assistants by using data from the 2004 National Nursing Assistant Survey. The objective of this study was first to describe the nature and prevalence of workplace injuries in nursing assistants

and then to assess the impact of physical and psychosocial works factors on the occurrence of back injuries and muscle strains in these nursing assistants.

## **METHODS**

Data for this study were from the 2004 National Nursing Assistant Survey (NNAS), which was conducted as supplement to the National Nursing Home Survey (NNHS). The NNAS was undertaken as a stratified, multistage, probability sample of Nursing Assistants (NA) that worked at a subset of nursing homes involved in the 2004 NNHS. The 2004 NNHS was the seventh iteration of the survey which was first administered in 1973 by the National Center for Health Statistics and the U.S. Department of Health and Human Services<sup>30</sup>. The NNHS is a nationally representative sample survey of United States nursing homes, their services, their staff, and their residents. The NNAS was the first survey of Nursing Assistants working in nursing homes.

NAs employed at each participating facility were randomly selected to participate in interviews, and all interviews were conducted using a computer-assisted telephone interview (CATI) system. In order to be eligible for participation, the NA had to work at least 16 hours a week and to assist residents with activities of daily living (ADLs) as a part of their job duties. The survey instrument included sections on recruitment, job history, education/training/licensure, management and supervision, organizational commitment and job satisfaction, workplace environment, work-related injuries, and demographics. The full NNAS methodology is explained elsewhere<sup>30</sup>.



The original dataset contained 3,017 records. 132 participants were excluded from the analysis because they were not currently employed and were under 18 (n=2,885). The NNAS was a cross-sectional survey; however, the data were analyzed as a case-control for this study's purpose. 1000 participants did not meet the definition for a case or control and were subsequently excluded from analysis (n=1885). Cases were defined as participants who had experienced a back injury or another pulled or strained muscle in the preceding 12 months (n=714). Controls were defined as participants who had not experienced any injury in the preceding 12 months (n=1,141).

### *Variables*

The survey contained several questions about injuries that occurred in the 12 months previous to survey administration. The injury types included in the survey were back injuries, muscle strains, bites, and wounds, bruising and other. Independent variables included in this analysis reflected demographics, physical factors associated with work, and psychosocial factors associated with work environment. Demographic variables included- age, sex, race, ethnicity, education, years working at facility, health insurance availability, health insurance use and facility ownership, size and location.

NAs were asked several questions about workload, training received and the type of equipment used during the course of their working days. This analysis was focused on risk factors associated with back injuries and muscle strains; therefore, covariates focused on training associated with injury prevention and use of lifting devices. Dichotomous covariates were payment type, whether NAs have to participate in mandated overtime, whether NA's have enough time to complete activities, and whether the facility provides

training on lifting devices and how to reduce injuries. Categorical variables were hours worked per week, how often NAs use lifting devices, and the availability of lifting devices.

The NNAS asked participants several questions about management/supervision and work environment. These questions were used to assess psychosocial factors associated with injury. Dichotomous variables in the analysis included: does NA have problems with supervisor, does NA have problems with co-workers, and does NA feel a lack of respect for work. Categorical variables in the analysis included: did the supervisor support progress in NA's career, help NA with job tasks, listen to NA, tell NA when doing a good job, value NA work and respect NA. Additional categorical variables included: how satisfied is NA with work place morale; how important does NA think their work is; how satisfied is NA with current job and would NA recommend work as NA at this facility.

Categorical and ordinal variables were derived by collapsing the following numeric variables: age group, education, and years working at facility, hours worked per week, payment type, and whether NA's have enough time to complete activities.

### *Statistical Analysis*

The characteristics of the workplace injuries reported by the NAs were assessed by univariate analysis, in which frequencies and percentages were presented. The data were analyzed as a case-control study and as an independent sample; population-weighted estimates were not calculated. Descriptive statistics were used to compare the cases and controls by the independent variables. Bivariate associations for demographics,

physical and psychosocial factors, with outcome status were calculated using chi-square test. Frequencies and percentages were shown for categorical and ordinal variables. Odds ratios and 95% confidence intervals were reported for dichotomous variables and the P-value associated with the chi-square test was reported for the ordinal variables.

In the statistical analysis, the difference in case status was examined through the use of multivariable logistic regression. Logistic regression was used to estimate the effect of physical and psychosocial work factors on case status, as well as controlling for possible confounders. First, separate regression models were examined for physical and psychosocial factors (Tables 5 and 6). Next, the results from this analysis were used to inform the main effects model (Table 7). Backward elimination was used to obtain the final covariates in the final model. All analyses were conducted using SAS 9.3<sup>31</sup>.

## **RESULTS**

Univariate analysis was performed to assess the injury profile of the survey population (Table 1). The majority of the NAs reported at least one injury in the last year, with only 40.6% reporting no injuries. The most commonly occurring injuries were wounds (45.1%), followed by bruising (19.3%) and back injuries (17%). NAs were most frequently injured due to resident aggression (59.7%) and from lifting, handling, or bathing a resident (50.0%).

Bivariate analysis between the outcome of interest and demographic characteristics is presented in Table 2. Females made up the majority of the NAs for the cases and the controls (93.1% and 91%, respectively). Similarly, education, ethnicity, and health insurance status were not significantly associated with the outcome. Overall, race

was found to be significantly associated with outcome status. African-Americans were found to have a decrease in odds of injury compared to their white counterparts (OR=0.48, 95% CI: 0.39-0.59). Working at the facility for 1 year (OR=2.16, 95% CI: 1.53-3.05) and working at the facility for 2-5 years (OR=1.77, 95% CI: 1.29-2.43) were significantly associated with outcome status. Additionally, working for a facility of 3-49 beds increased the odds of injury compared to those nursing assistants working in a facility of 200+ beds (OR=1.62, 95% CI: 0.99-2.62).

The association between physical factors and job training and back or muscle injury was analyzed using bivariate analysis (Table 3). NAs who responded that they did not have enough time to complete activities were more likely to have suffered a back or muscle injury (OR=2.19, 95% CI= (1.79-2.69)). There was a significant association between NAs that participated in mandated overtime and outcome status (OR=2.09, 95% CI= 1.65- 2.63). The numbers of hours worked per week and payment type were not significantly associated with reporting a back injury or muscle strain. There was a significant association between outcome and whether or not the facility provided training to reduce workplace injuries. NAs who reported an injury were more likely to report that their facility did not provide training, in other words training was protective (OR=0.46, 95% CI: 0.33-0.63). Similarly, NAs who reported that initial training poorly or fairly prepared them to prevent workplace injury were more likely to report injury than NAs who reported training was good or excellent (chi-square<sub>df3</sub>=33.22, P=<0.001).

Further bivariate analysis was performed to evaluate the impact of psychosocial factors, such as work environment, on outcome status (Table 4). When asked if the supervisor supports the progress of the NAs' career, NAs who reported in the affirmative

were less likely to experience injury. NAs who answered in the negative in response to other similar variables (does supervisor help with tasks, listen, provide affirmations and respect and value NA's work) were more likely to be a case than a control. Having problems with the supervisor and co-workers were both significantly associated with outcome status (OR=1.76, 95%CI: 1.41-2.19); (OR=1.27, 95%CI: 1.05-1.55). Job satisfaction was significantly associated with outcome status; cases were more likely to report being somewhat and extremely dissatisfied with current job (chi-square<sub>df3</sub>=158.73, P=<0.001). NAs who reported that they would probably not and definitely not recommend work as a NA were more likely to be cases than controls (chi-square<sub>df3</sub>=73.51, P=<0.001).

Logistic regression was used to analyze the association between case status and physical and psychosocial work factors, while controlling for possible confounders. Table 5 presents the results of the first logistic model examining the association between case status and physical work factors, while controlling for confounders. NAs who responded that they did not have enough time to complete activities were more likely to have suffered a back or muscle injury (OR= 1.94, 95% CI: 1.55-2.52). Having to participate in mandatory overtime was significantly associated with case status (OR=1.69, 95%CI: 1.29-2.21). Similarly, NAs who reported that initial training poorly prepared them to prevent workplace injury were more likely to report injury than NAs who reported training was excellent (OR= 3.90, 95% CI: 1.57-9.68). Additionally, NAs who reported that their facility provided training were less likely to report an injury (OR=0.53, 95% CI: 0.37-0.77) and African-Americans were found to have a decrease in odds of injury compared to their white counterparts (OR=0.57, 95%CI: 0.44-0.73).

A second model was performed analyzing the association between case status and psychosocial work factors (Table 6). Job satisfaction was significantly associated with outcome status, those who reported extreme dissatisfaction with their job were more likely to have suffered a back or muscle injury (OR=5.91, 95% CI: 3.32-10.50). When NAs were asked if they thought their supervisors listened to them, those who responded somewhat agree and somewhat disagree had increased odds of injury compared to those who answered strongly agree (OR=1.36, 95% CI: 1.01-1.83; OR=2.07, 95% CI: 1.15-3.71). The results of the main effects model are presented in Table 7. The Hosmer and Lemeshow Goodness of Fit test was performed and provided evidence that the model was a good fit (p=.7555). Controlling for all variables through logistic regression, not having enough time to complete activities (OR=1.43, 95% CI: 1.13-1.82), mandated overtime (OR=1.47, 95% CI: 1.11-1.94), and being extremely dissatisfied with the job were significantly associated with experiencing a back or muscle injury (OR= 5.36, 95% CI: 2.92-9.83). Additionally, NAs who worked for facilities that provided training on preventing workplace injuries were less likely to report a back or muscle injury (OR= 0.65, 95% CI: 0.44-0.97).

## **DISCUSSION**

Nursing assistants have the highest rate of injury compared to other healthcare personnel<sup>5,8,26,32,33</sup>. Due to these risks, it is necessary to assess the prevalence of injuries and how these affect the workforce. The present study attempted to do just that. The objective of this study was first to describe the nature and prevalence of workplace injuries in nursing assistants and then to assess the impact of physical and psychosocial

works factors on the occurrence of back injuries and muscle strains in these nursing assistants.

More than half of the NAs reported at least one injury in the last year, which is consistent with previous statistics providing evidence that this is a high risk profession<sup>5</sup>. The most commonly occurring injuries were wounds (45.1%), followed by bruising (19.3%) and back injuries (17%). Existing literature has found a prevalence of back injury similar to ours<sup>34</sup>. Collins et al.<sup>34</sup> conducted a pre-post intervention trial examining best practice musculoskeletal injury prevention programs in six nursing homes; among a cohort of 1728, they found a prevalence injury rate of 18%. Injuries were likely to occur while the NA was lifting, handling, or bathing a resident. These activities are frequently linked to back injury rates in healthcare workers and interventions are aimed at easing the lifting of residents on healthcare workers. In Washington State, health care workers have the highest rate of compensable back injuries and in an attempt to reduce these injuries a zero lift program was implemented in 31 of its 38 hospitals<sup>35</sup>. Charney et al.<sup>35</sup> compared patient-handling injury data prior to program implementation with those after program implementation and found patient-handling injury claims decreased by 43%. More research is needed in order to firmly establish a link between lifting programs and reduction of back injury as results are still mixed; in a systematic review, Dawson et al.<sup>36</sup> found no strong evidence regarding the efficacy of any interventions aiming to prevent back pain and injury in nurses.

Organizational characteristics and demographics were examined in association with injury rates. African-Americans were found to have a decrease in odds of injury compared to their white counterparts; this protective relationship was found in bivariate

analyses and held through logistic regression. This relationship is novel and has not been investigated in other literature. The mechanism behind this protective effect is unknown and further research should examine it. Those who worked at the facility for 1-5 years were found to have higher odds of injury than those working at the facility for 10 or more years. Facilities with a smaller number of beds were found to have NAs who were more likely to report experiencing an injury. Castle et al.<sup>6</sup> found that facilities with a higher average occupancy were more likely to report high injury rates. The occupancy levels of the facilities were not included in our dataset. In 2006, Castle and Engberg<sup>37</sup> investigated the association between worker turnover and the organizational characteristics of nursing homes and found a contrasting bed size association. The 1-year turnover rate for CNAs was 56.4%, and the results showed that lower staffing levels, lower quality, for-profit ownership, and higher bed size are associated with higher turnover<sup>37</sup>. While this study examines turnover rates in workers, it has been shown previously that similar factors impact injury rates. Inadequate human resources to provide quality care for a large number of residents quickly leads to physical work overload and burnout, which increase the risk for back injury and job dissatisfaction that would lead to exiting the workplace. Further analysis in this study takes a more detailed look at the physical work factors in relation to back injury.

Nursing assistants provide the majority of direct care to residents in nursing homes in the US, including assistance with ADLs (eating, bathing, toileting, transferring, and dressing). Research suggests that patient handling is a leading cause of injuries among nursing home workers in the US<sup>38</sup>; therefore, it is important to understand what types of interventions would reduce injury rates. Currently, the literature provides mixed



results of the effectiveness of interventions such as assistive devices and worker training<sup>39</sup>. Training and physical characteristics of the work, as well as availability and use of safety equipment were analyzed in association with injury rates in the present study. NAs who reported an injury were more likely to report that their facility did not provide training on how to reduce injury and that initial training poorly or fairly prepared them to prevent workplace injury. Though the body of evidence on this particular area is not large, similar results were found in a national survey of home health aides<sup>40</sup>, indicating that the direct care workforce is not properly trained and educated. This would align with the reasoning behind the Paraprofessional Healthcare Institute (PHI)<sup>15</sup>, calling for a change in the education and training provided to NAs, citing the existing guidelines as outdated and ineffective.

Physical workload is often associated with job stress on NAs, which has shown to be associated with injury rates<sup>33</sup>. Due to this, physical work factors were examined. NAs who responded that they did not have enough time to complete activities and had mandated overtime were more likely to have suffered a back or muscle injury. These results are not surprising; CNAs' reported that having too many patients and not receiving enough help create the most difficult part of their jobs<sup>7</sup>. Trinkoff et al.<sup>41</sup> found in a cross-sectional study of nurses that moderate and high perceived physical demands were significantly associated with reported MSDs, even after adjustments for demographic and lifestyle-related covariates. Institutions and employees need to recognize this gap because evidence shows that when facilities offer more and consistent assistance to their employees, the number of MSDs decline<sup>42</sup>.

Not only have employee training and physical workload found to be associated with injury in nursing assistants, but it has also been found that nursing assistant injury rates are related to employee ratings of support, and employee engagement<sup>16</sup>. In a systematic review that included eleven cohort and two case-control studies<sup>43</sup>, evidence was found for low social support in the workplace and low job satisfaction as risk factors. Our findings agree with recent literature. NAs who reported positive supervisor supports were less likely to report an injury than those NAs who did not receive positive feedback and support from their supervisor. Similarly, having problems with the supervisor and co-workers were both significantly associated with reporting an injury. Nursing assistants who reported job dissatisfaction had higher odds of experiencing an injury than those NAs who reported being satisfied with their position. While it is important to know that these factors are playing a role in injury in nursing assistants, the mechanism behind this is less understood. There is much needed research on the impact of work environment and supervisor support on injury rates in this direct care workforce. A few studies have interviewed NAs on their perceptions of their work environments and safety risk and have provided meaningful data<sup>7,8,18,44</sup>. In a study interviewing nursing assistants in Iowa, Culp et al.<sup>18</sup> found that there is a need for change in management and the way the NAs are treated by their supervisors. Human resource practices in nursing homes need to evolve so CNAs experience respectful and supportive supervisors, and receive acknowledgement from supervisors for a job well done. It seems that these qualities would be a given, but Stanav et al.<sup>8</sup> found similar results in a survey of Ohio nursing homes. Nursing assistants often felt that supervisors, largely RNs, “looked down” on them and that the RNs believe that they were “above CNA skills.”<sup>8</sup> Feeling disrespected

and undervalued and poor communication among healthcare providers are risk factors for injury among NAs. These reports demonstrate the need for a wide-scale change in communication and a need for initiatives to address the issues. Sofie et al.<sup>44</sup> found similar communication gaps between CNAs and the administration while interviewing CNAs on their perceived safety risks in the workplace. There were knowledge gaps in the NAs about available safety programs because of a lack of communication from the administration.

In order to account for the impact of both physical and psychosocial work factors in association with back and strain injuries, multivariable logistic regression was used. In the first model which only looked at physical factors, not having enough time to complete activities, having poor injury prevention training and not working in a facility that offered injury prevention training was associated with injury. Job satisfaction alone was found to be significantly associated with outcome status in a model only examining psychosocial work factors. Controlling for all variables, not having enough time to complete activities, not having proper initial training on preventing work injuries, and dissatisfaction with the job were significantly associated with experiencing a back or muscle injury. These results are important because it shows the impact of workload, training, and work environment on injuries. It demonstrates the complex nature of injury and how any effective intervention to reduce them is going to need to be a multifaceted approach. Past studies have looked at training and work environment separately, but no research to date has looked at the interaction of the two. This points to a large gap in the research and elucidates the need for future research on this topic. Injuries, particularly MSDs, will not go away until this approach is used.

## **Limitations**

This study had several limitations. First, the data was from the NNAS which was administered in 2004; therefore, the data may not represent the current state of nursing assistants or long-term care facilities. However, the NNAS is the first national probability survey of nursing assistants and still remains the largest and richest data set on this group of professionals. Secondly, the data were collected from interviews and relied on self-reporting from the NAs on their injuries and experiences in the last 12 months. It could be difficult for an NA to remember an accident from a year ago; therefore, recall bias could impact the validity of the data and lead to misclassification. Also, nursing assistants may have not been comfortable sharing sensitive information which can also limit the validity of the data. Thirdly, the design of the data was cross-sectional, which excludes any inferences to be made about causation. Additionally, the results of the study were derived from a secondary analysis of the NNAS, which provides restrictions on the available variables. While information was provided on worker injury, the survey was not specifically designed to evaluate physical and psychosocial factors on injury which creates gaps in the data and limits the analysis and possibly the generalizability of the results. Lastly, the healthy worker effect could impact the results. Workers usually are healthier than the general population because the severely ill and chronically disabled are not able to work. In reference to the present study, those nursing assistants who were seriously injured during work could have left the workplace; therefore, their information is not captured in this study.

## **Future Directions**

We have found that a significant portion of nursing assistants experience occupational injuries and that these injuries are significantly associated with measures of excessive workload, as well as psychosocial factors, such as job dissatisfaction and lack of supervisor support. As the baby boomer generation ages and life expectancy increases, the number of individuals relying on long-term care services is going to increase dramatically. In order to provide these individuals with the best quality of care, it is going to be imperative that the long-term care workforce remain safe and satisfied in their positions. Therefore, much work is needed to be done on this front and can only be done so through evidence-based research. The body of knowledge on the factors affecting workplace injuries in nursing assistants is severely limited and the majority of published research has used this study's dataset which is over 10 years old. It is time to make this group of professionals a priority because they are on the front-line of workers responsible for taking care of our aging population. On this front, recommendations for future research related to this are proposed. Further research is needed to specifically examine the relationship of worker injury to workplace outcomes for NAs, as studies specifically examining the association between work environment and injury are limited. Another large, scale study such as the NNAS needs to be done. It is unacceptable that the richest data on this population is a decade old and the current status of nursing assistants and long-term care facilities needs to be evaluated. A more comprehensive study should include a deeper look at the organizational and management characteristics, as well as the resident characteristics. Another potential area of research includes asking administration about their perceptions of communication, safety and management of the nursing

assistant staff. It would be helpful to compare the management perceptions to the nursing assistants' and determine where there are gaps. As the results of this study indicate, management plays an important role on setting the tone of the work environment and changes need to be made in management style and communication. Efforts to prevent injury and to improve workplace communication between CNAs and nurses need to be prioritized as it is likely this will yield benefits far beyond improved safety. The PHI has attempted to change the guidelines on training for NAs, in order to help with this cause, additional research is needed to better understand the most efficacious types of worker training, to reduce worker injury.

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## **BIOGRAPHICAL SKETCH**

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## **APPENDIX. TABLES AND FIGURES**

**Table 1. Characteristics of Injuries Reported in the previous 12 months by Nursing Assistants interviewed in the National Nursing Assistant Survey, 2004**

<b>Characteristic</b>	<b>N</b>	<b>Percent</b>
<b>Type of Injury</b>		
Back Injury		
Yes	491	17.0
No	2390	83.0
Strained/Pulled Muscle		
Yes	448	15.5
No	2433	84.5
Human Bites		
Yes	346	12.0
No	2538	88.0
Scratches, Wounds, Cuts		
Yes	1301	45.1
No	1585	54.9
Black eyes, bruising		
Yes	556	19.3
No	2329	80.7
Other Injuries		
Yes	207	7.2
No	2676	92.8
<b>How did Injury Happen</b>		
Lifting, Bathing, Handling Resident		
Yes	863	50.0
No	864	50.0
Slips, Trips, Falls		
Yes	80	4.6
No	1647	95.4
Aggression by Residents		
Yes	1031	59.7
No	696	40.3
Bumping, Hitting Equipment		
Yes	208	12.0
No	1519	88.0
Concern with Residents' Health		
Yes	7	0.40
No	1720	99.6
Other		
Yes	87	5.0
No	1640	95.0
<b>Number Of Injuries</b>		
None	1141	40.6
One	571	20.3
Two	377	13.4
Three	195	6.9
Four or More	527	18.7
*N=2885, Missing values excluded from analysis		

**TABLE 2. Demographics and Facility Characteristics Associated with Injury Status among US Nursing Assistants interviewed in the National Nursing Assistant Survey, 2004**

Characteristic	Cases (n=714)	Controls (n=1141)	OR	95% CI	P-value <sup>§</sup>
<b>Gender (No. and %)</b>					
Male	49 (6.9)	103 (9)	0.74	0.52 to 1.06	0.098
Female	665 (93.1)	1039 (91)	1.00		
<b>Age Group, y (No. and %)</b>					
18-24	143 (20.0)	186 (16.3)	1.48	1.04-2.13	0.019
25-34	192 (26.9)	269 (22.6)	1.4	0.98-1.93	
35-44	159 (22.3)	313 (27.4)	0.98	0.69-1.38	
45-54	148 (20.7)	234 (20.5)	1.22	0.86-1.73	
55+*	72 (10.1)	139 (12.2)	1.00		
<b>Race (No. and %)</b>					
White*	476 (66.7)	578 (50.7)	1.00		<0.01
Black	189 (26.5)	479 (42.0)	0.48	0.39-0.59	
Asian	20 (2.80)	42 (3.7)	0.58	0.33-0.99	
Other	29 (4.1)	42 (3.7)	0.84	0.51-1.37	
<b>Ethnicity (No. and %)</b>					
Hispanic	61 (8.5)	113 (9.9)	0.85	0.61 to 1.17	0.317
Non-Hispanic*	653 (91.5)	1024 (61.4)	1.00		
<b>Education (No. and %)</b>					
Less than High School	205 (29.0)	333 (29.4)	1.14	0.68-1.89	0.159
High School Diploma	309 (43.8)	533 (47.1)	1.07	0.65-1.76	
Some College	166 (23.5)	218 (19.3)	1.41	0.84-2.36	
College Degree*	26 (3.7)	48 (4.2)	1.00		
<b>Job Tenure at Current Facility (No. and %)</b>					
<1 Year	227 (31.8)	454 (39.8)	1.07	0.79-1.43	<0.001
1 Year	131 (18.4)	130 (11.4)	2.16	1.53-3.05	
2-5 Years	178 (24.9)	215 (18.8)	1.77	1.29-2.43	
6-10 Years	85 (11.9)	143 (12.5)	1.27	0.88-1.83	
10+ Years*	93 (13.0)	199 (17.4)	1.00		
<b>Health Insurance Available (No. and %)</b>					
Yes	634 (89.7)	986 (87.6)	1.22	0.91 to 1.65	0.186
No*	73 (10.3)	139 (12.4)	1.00		
<b>Has Health Insurance (No. and %)</b>					
Yes	318 (50.2)	486 (49.3)	1.04	0.85 to 1.26	0.733
No*	316 (49.8)	500 (50.7)	1.00		
<b>Facility Ownership (No. and %)</b>					
For Profit	391 (54.8)	668 (58.6)	0.86	0.71 to 1.04	0.109
All Others*	323 (45.2)	473 (41.4)	1.00		

<b>Facility Size (No. and %)</b>					
3-49 Beds	126 (17.7)	151 (13.2)	1.62	0.99-2.62	0.033
50-99 Beds	274 (38.4)	426 (37.3)	1.25	0.79-1.95	
100-200 Beds	281 (39.4)	500 (43.8)	1.09	0.69-1.7	
200+ Beds*	33 (4.6)	64 (5.6)	1.00		
<b>Facility Location (No. and %)</b>					
Neither	160 (22.4)	232 (20.3)	1.14	0.90-1.45	0.544
Micropolitan (10,000-49,000)	166 (23.3)	266 (23.3)	1.03	0.82-1.3	
Metropolitan (50,000+)*	388 (54.3)	643 (56.4)	1.00		
OR= Odds Ratio CI= Confidence Interval §P-value associated with Chi-Square					
*Referent Category	N=1855	Missing Values Excluded from analysis			

**TABLE 3. Select Characteristics Representing Training and Physical Factors of Work Associated with Injury Status Among US Nursing Assistants interviewed in the National Nursing Assistant Survey, 2004**

<b>Characteristic</b>	<b>Cases (n=714)</b>	<b>Controls (n=1141)</b>	<b>OR</b>	<b>95% CI</b>	<b>P-value<sup>§</sup></b>
<b>Hours Worked per Week (No. and %)</b>					
More than 40	62 (8.7)	104 (9.1)	0.95	0.67-1.34	0.949
Less than 40	353 (49.4)	563 (49.3)	0.99	0.82-1.21	
40*	299 (41.9)	474 (41.5)	1.00		
<b>How is NA paid (No. and %)</b>					
Hourly	654 (92.0)	1054 (92.4)	0.95	0.67-1.34	0.759
Monthly or Salary*	57 (8.0)	87 (7.6)	1.00		
<b>Do NA's Have Enough Time to Complete Activities (No. and %)</b>					
Not Enough Time	395 (61.0)	380 (41.6)	2.19	1.79 to 2.69	<0.001
Enough Time*	253 (39.0)	534 (58.4)	1.00		
<b>Mandated Overtime (No. and %)</b>					
Yes	192 (27.1)	171 (15.1)	2.09	1.65 to 2.63	<0.001
No*	517 (72.9)	961 (84.9)	1.00		
<b>How Often does NA use Lifting Devices (No. and %)</b>					
Always	404 (56.7)	654 (57.3)	0.98	0.66-1.46	0.970
Sometimes	264 (37.1)	417 (36.6)	1.00	0.67-1.51	
Never*	44 (6.2)	70 (6.1)	1.00		
<b>Are Lifting Devices Available When Needed (No. and %)</b>					
Never	8 (1.1)	14 (1.2)	0.97	0.40-2.31	0.005
Almost Never	17 (2.4)	10 (0.8)	2.88	1.31-6.32	
Sometimes	95 (13.3)	113 (10.0)	1.42	1.06-1.90	
Always*	592 (83.2)	1002 (88.0)	1.00		
<b>Has NA received training on lifting devices (No. and %)</b>					
Yes	703 (98.6)	1131 (99.1)	0.62	0.26 to 1.50	0.286
No*	10 (1.4)	10 (0.9)	1.00		
<b>Does Facility provide training to reduce injuries (No. and %)</b>					
Yes	603 (86.1)	1048 (93.2)	0.46	0.33 to 0.63	<0.001
No*	97 (13.9)	77 (6.8)	1.00		
<b>How well did initial training prepare you to prevent injuries (No. and %)</b>					
Poor	23 (3.3)	13 (1.1)	3.61	1.80-7.22	<0.001
Fair	74 (10.5)	75 (6.6)	2.01	1.42-2.85	
Good	297 (42.2)	415 (36.6)	1.46	1.19-1.78	
Excellent*	310 (44.0)	632 (55.7)	1.00		
OR= Odds Ratio	CI= Confidence Interval	§P-value associated with Chi-Square			
*Referent Category	N= 1855	Missing values excluded from analysis			



**TABLE 4. Select Characteristics Representing Social Support and Work Environment Associated with Injury Status Among US Nursing Assistants interviewed in the National Nursing Assistant Survey, 2004**

Characteristic	Cases (n=714)	Controls (n=1141)	OR	95% CI	P-value <sup>§</sup>
<b>Supervisor supports progress in NA's career (No. and %)</b>					
Strongly Agree*	294 (42.3)	613 (55.0)	1.00		<0.001
Somewhat Agree	187 (26.9)	308 (27.7)	1.27	1.01-1.59	
Somewhat Disagree	88 (12.7)	82 (7.4)	2.24	1.61-3.12	
Strongly Disagree	126 (18.1)	111 (9.9)	2.37	1.77-3.16	
<b>Supervisor helps NA with job tasks, when needed (No. and %)</b>					
Strongly Agree*	292 (41.2)	642 (56.7)	1.00		<0.001
Somewhat Agree	185 (26.1)	281 (24.8)	1.45	1.15-1.82	
Somewhat Disagree	74 (10.4)	74 (6.5)	2.20	1.55-3.12	
Strongly Disagree	158 (22.3)	136 (12.0)	2.55	1.95-3.34	
<b>Supervisor listens to NA (No. and %)</b>					
Strongly Agree*	430 (60.6)	893 (78.6)	1.00		<0.001
Somewhat Agree	173 (24.4)	170 (14.9)	2.11	1.66-2.69	
Somewhat Disagree	47 (6.6)	26 (2.3)	3.75	2.29-6.14	
Strongly Disagree	60 (8.5)	47 (4.1)	2.65	1.78-3.95	
<b>Supervisor tells NA when doing a good job (No. and %)</b>					
Strongly Agree*	293 (41.2)	693 (61.2)	1.00		<0.001
Somewhat Agree	193 (27.1)	249 (21.9)	1.83	1.45-2.31	
Somewhat Disagree	78 (10.9)	65 (5.7)	2.84	1.98-4.05	
Strongly Disagree	147 (20.7)	128 (11.3)	2.12	2.07-3.57	
<b>How much does supervisor value NA work (No. and %)</b>					
Very Much*	332 (46.6)	717 (63.1)	1.00		<0.001
Somewhat	302 (42.4)	370 (32.5)	1.76	1.44-2.15	
Not at all	79 (11.1)	50 (4.4)	3.41	2.34-4.98	
<b>Are NA's respected by supervisors (No. and %)</b>					
A great deal*	347 (48.7)	729 (64.2)	1.00		<0.001
Somewhat	303 (42.6)	370 (32.6)	1.72	1.41-2.10	
Not at all	62 (8.7)	36 (3.2)	3.62	2.35-5.56	
<b>Does NA have problems with supervisors (No. and %)</b>					
Yes	201 (28.4)	209 (18.4)	1.76	1.41 to 2.19	<0.001
No*	508 (71.6)	927 (81.6)	1.00		
<b>Does NA have problems with co-workers (No. and %)</b>					
Yes	242 (34.1)	329 (29.0)	1.27	1.04 to 1.55	0.019
No*	467 (65.9)	807 (71.0)	1.00		
<b>Does NA feel a lack of respect for work (No. and %)</b>					
Yes	126 (17.8)	88 (7.7)	2.57	1.92 to 3.44	<0.001
No*	583 (82.2)	1048 (92.3)	1.00		

<b>How satisfied is NA with work place morale (No. and %)</b>					
Extremely Satisfied*	133 (18.8)	388 (34.3)	1.00		<0.001
Somewhat Satisfied	362 (51.1)	570 (50.4)	1.85	1.46-2.35	
Somewhat Dissatisfied	126 (17.8)	122 (10.8)	3.01	2.19-4.14	
Extremely Dissatisfied	88 (12.4)	51 (4.5)	5.03	2.38-7.49	
<b>NA is involved in challenging work (No. and %)</b>					
Strongly Agree*	460 (64.8)	799 (70.6)	1.00		0.001
Somewhat Agree	170 (23.9)	260 (23.0)	1.14	0.91-1.42	
Somewhat Disagree	40 (5.6)	43 (3.8)	1.62	1.04-2.52	
Strongly Disagree	40 (5.6)	30 (2.7)	2.32	1.42-3.77	
<b>How important does NA think their work is (No. and %)</b>					
Very Important*	690 (96.6)	1117 (98.0)	1.00		0.064
Somewhat Important	23 (3.2)	19 (1.7)	1.96	1.06-3.62	
Not important at all	1 (0.1)	4 (0.3)	0.4	0.04-3.63	
<b>How satisfied is NA with current job (No. and %)</b>					
Extremely Satisfied*	121 (17.0)	456 (40.1)	1.00		<0.001
Somewhat Satisfied	379 (53.2)	550 (48.3)	2.6	2.04-3.30	
Somewhat Dissatisfied	153 (21.5)	106 (9.3)	5.44	3.96-7.48	
Extremely Dissatisfied	60 (8.4)	26 (2.3)	8.69	5.26-14.37	
<b>Would NA recommend work as NA at this facility (No. and %)</b>					
Definitely Recommend*	241 (34.1)	592 (52.1)	1.00		<0.001
Probably Recommend	299 (42.4)	412 (36.2)	1.78	1.44-2.20	
Probably Not Recommend	108 (15.3)	93 (3.5)	2.85	2.08-3.91	
Definitely Not Recommend	58 (8.2)	40 (3.5)	3.56	2.32-5.47	
OR= Odds Ratio		CI= Confidence Interval	§P-value associated with Chi-Square		
*Referent Category		N=1855	Missing Values Excluded From Analysis		

**TABLE 5. Multivariable Logistic Regression Results for Case Status According to Selected Demographic and Physical Work Factors**

<b>Characteristic</b>	<b>OR</b>	<b>95% CI</b>
<b>Age Group, years</b>		
18-24	1.27	0.81-1.98
25-34	1.38	0.92-2.08
35-44	0.93	0.62-1.39
45-54	1.16	0.78-1.75
55+	ref	
<b>Gender</b>		
Female	ref	
Male	0.86	0.57-1.30
<b>Race</b>		
White	ref	
Black	0.61	0.47-0.78
Asian	1.09	0.55-2.16
Other	1.11	0.61-1.99
<b>Hispanic</b>		
Non-Hispanic	ref	
Hispanic	0.81	0.56-1.19
<b>Job Tenure at Current Facility</b>		
<1 Year	0.97	0.68-1.40
1 Year	2.36	1.55-3.58
2-5 Years	1.61	1.11-2.33
6-10 Years	1.28	0.84-1.94
10+ Years	ref	
<b>Do NA's Have Enough Time to Complete Activities</b>		
Enough Time	ref	
Not enough time	1.94	1.55-2.52
<b>Mandated Overtime</b>		
No	ref	
Yes	1.69	1.29-2.21
<b>Has NA received training on lifting devices</b>		
No	ref	
Yes	0.89	0.31-2.57
<b>Does Facility Provide Training to Prevent Injuries</b>		
No	ref	
Yes	0.53	0.37-0.77
<b>How well did initial training prepare you to prevent injuries</b>		
Excellent	ref	
Good	1.41	1.12-1.78
Fair	1.47	0.98-2.21
Poor	3.90	1.57-9.68

**TABLE 6. Multivariable Logistic Regression Results for Case Status According to Selected Demographic and Psychosocial Work Factors**

<b>Characteristic</b>	<b>OR</b>	<b>95% CI</b>
<b>Age Group, years</b>		
18-24	1.15	0.72-1.72
25-34	1.14	0.76-1.71
35-44	0.93	0.63-1.38
45-54	1.19	0.80-1.76
55+	ref	
<b>Gender</b>		
Female	ref	
Male	0.68	0.46-1.01
<b>Race</b>		
White	ref	
Black	0.57	0.44-0.73
Asian	1.04	0.52-2.09
Other	1.01	0.55-1.87
<b>Hispanic</b>		
Non-Hispanic	ref	
Hispanic	0.78	0.55-1.12
<b>Job Tenure at Current Facility</b>		
<1 Year	0.96	0.68-1.36
1 Year	1.94	1.30-2.89
2-5 Years	1.48	1.04-2.12
6-10 Years	1.22	0.81-1.83
10+ Years	ref	
<b>Supervisor supports progress in NA's career</b>		
Strongly Agree	ref	
Somewhat Agree	0.96	0.73-1.26
Somewhat Disagree	1.27	0.84-1.91
Strongly Disagree	1.20	0.81-1.80
<b>Supervisor helps NA with job tasks, when needed</b>		
Strongly Agree	ref	
Somewhat Agree	0.91	0.69-1.21
Somewhat Disagree	0.99	0.65-1.53
Strongly Disagree	1.06	0.73-1.55
<b>Supervisor listens to NA</b>		

Strongly Agree	ref	
Somewhat Agree	1.36	1.01-1.83
Somewhat Disagree	2.07	1.15-3.71
Strongly Disagree	1.05	0.62-1.77
<b>Supervisor tells NA when doing a good job</b>		
Strongly Agree	ref	
Somewhat Agree	1.23	0.92-1.64
Somewhat Disagree	1.42	0.91-2.20
Strongly Disagree	1.18	0.77-1.79
<b>How much does supervisor value NA work</b>		
Very Much	ref	
Somewhat	0.99	0.75-1.33
Not at all	1.12	0.64-1.93
<b>Are NA's respected by supervisors</b>		
A great deal	ref	
Somewhat	0.87	0.65-1.17
Not at all	1.27	0.69-2.33
<b>How satisfied is NA with current job</b>		
Extremely Satisfied	ref	
Somewhat Satisfied	2.33	1.78-3.04
Somewhat Dissatisfied	3.99	2.75-5.80
Extremely Dissatisfied	5.91	3.32-10.50

**TABLE 7. Multivariable Logistic Regression Results for Final Main Effects Model for Case Status According to Selected Demographic, Physical and Psychosocial Work Factors**

<b>Characteristic</b>	<b>OR</b>	<b>95% CI</b>
<b>Age Group, years</b>		
18-24	1.09	0.69-1.73
25-34	1.15	0.75-1.76
35-44	0.84	0.56-1.28
45-54	1.10	0.72-1.68
55+	ref	
<b>Gender</b>		
Female	ref	
Male	0.74	0.48-1.14
<b>Race</b>		
White	ref	
Black	0.57	0.44-0.73
Asian	1.04	0.52-2.09
Other	1.01	0.55-1.87
<b>Job Tenure at Current Facility</b>		
<1 Year	0.93	0.64-1.35
1 Year	2.22	1.45-3.42
2-5 Years	1.51	1.04-2.21
6-10 Years	1.29	0.84-1.98
10+ Years	ref	
<b>Do NA's Have Enough Time to Complete Activities</b>		
Enough Time	ref	
Not enough time	1.43	1.13-1.82
<b>Mandated Overtime</b>		
No	ref	
Yes	1.47	1.11-1.94
<b>Does Facility Provide Training to Prevent Injuries</b>		
No	ref	
Yes	0.65	0.44-0.97
<b>How well did initial training prepare you to prevent injuries</b>		
Excellent	ref	
Good	1.29	1.01-1.64

Fair	1.19	0.78-1.81
Poor	2.65	1.06-6.5
<b>Supervisor listens to NA</b>		
Strongly Agree	ref	
Somewhat Agree	1.36	1.02-1.82
Somewhat Disagree	2.22	1.24-3.98
Strongly Disagree	0.98	0.60-1.59
<b>How satisfied is NA with current job</b>		
Extremely Satisfied	ref	
Somewhat Satisfied	2.25	1.68-3.02
Somewhat Dissatisfied	3.55	2.40-5.26
Extremely Dissatisfied	5.36	2.92-9.83