8-9-2014

Analysis of Risk Factors Contributing to Home–Based Direct Care Workers (DCWS) Occupational Injury in Long–Term Care

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ANALYSIS OF RISK FACTORS CONTRIBUTING TO HOME–BASED DIRECT CARE WORKERS (DCWS) OCCUPATIONAL INJURY IN LONG–TERM CARE

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Bachelor of Science
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Submitted in Partial Fulfillment of the Requirements

For the Degree of Doctor of Philosophy in

Health Services, Policy, and Management

The Norman J. Arnold School of Public Health

University of South Carolina

2014

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DEDICATION

To my beloved parents, Yahya Hamadi and Nazik Zakari, without whom this dissertation would not have been possible. Their endless love, support, and words of wisdom gave me the strength to reach my dreams. I am grateful they were there for me and I know they are proud of the woman I am today.

To my siblings Omar, Walaa and Abdulrahman, for their uplifting comments and support. I am thankful they surrounded me with love and laughter.

To my fiancé, Anthony Wathen, for his patience, motivation and words of encouragement. I am fortunate to have you in my life.

ACKNOWLEDGEMENTS

All my thanks and acknowledgments are to God for his infinite bounties, which supplied all the success he has bestowed upon me.

I want to acknowledge and express my deepest gratitude to my committee chair, Dr. Janice Probst, for her kindness, continued guidance and thoughtful suggestions during my doctoral journey. Her easy rapport, patience, and sincere interest in my progress were always evident.

I also wish to express my sincere appreciation to my committee members, Dr. Jessica Bellinger, Dr. M. Mahmud Khan, and Dr. Candace Porter, for sharing their knowledge, insights, and suggestions.

I also want to acknowledge and thank my mentors, Dr. Ana Lòpez–De Fede and Dr. Michael Byrd, for providing me with opportunities to grow as a researcher. I owe them a debt of gratitude for investing in me.

ABSTRACT

Home–based direct care workers (DCWs) provide care in a unique workplace environment: the patient's home. The high rate of injuries experienced by this subcategory of healthcare workers compared to other industries and occupations make the need to understand the risk factors for these injuries vital. This study builds on prior research and specifically profiles occupational injury patterns among home–based DCWs who deliver care primarily in patient homes and the association of individual, perceived environmental and ergonomic characteristics on predicting occupational injury. The study used a cross–sectional analysis of secondary data from the 2007 National Home Health Aide Survey (NHHAS), sampling six eligible DCWs across the United States in home health, hospice, and mixed agencies. All analyses were conducted using STATA 12.0. Multivariable logistic regression was used to determine if perceived training, work environment and ergonomic factors predict workers risk for occupational injury. The findings Holding other variables constant race, hours worked per week, and number of current employers were found to be risk factors for occupational injury. The prevalence of injury reporting was lower in non–White and part time employed HHAs consistent with findings of previous studies. In addition, race, education level, hourly pay rate and agency location, type, and ownership status were found to be risk factors for injury severity. Overall, HHAs were satisfied with their perceived training topic areas, work environment and availability of safety devices. Multivariate adjusted analyses revealed perceived training was not a risk factor for injury or its severity. Perceived poor

organizational culture was found to increase the risk for work–related injury by three folds and the lack of needed devices to perform job duties safely increased HHAs risk for occupational injury. Thus, addressing modifiable risk factors for occupational injury may reduce preventable injuries and improve worker safety.

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List of Abbreviations

AARP ..... American Association of Retired Persons

BLS ..... Bureau of Labor Statistics

HRSA ..... Health Resources and Services Administration

MEDPAC ..... Medicare Payment Advisory Commission

NIOSH ..... National Institute for Occupational Safety and Health

OSHA ..... Occupational Safety and Health Administration

HHC ..... Home Health and Hospice Care

LTC ..... Long–Term Care

NHHAS ..... National Home Health Aide Survey

NHHCS ..... National Home and Hospice Care Survey

CNAs ..... Certified Nursing Assistants

PPS ..... Prospective Payment System

DCWs ..... Direct Care Workers

HHAs ..... Home Health and Hospice Aides

LPN/LVN ..... Licensed Practical/Vocational Nurse

PCAs ..... Personal Care Aides

RN ..... Registered Nurse

ADLs ..... Activities of Daily Living

IADLs ..... Instrumental Activities of Daily Living

MSDs ..... Musculoskeletal Disorders

CHAPTER 1

INTRODUCTION

This chapter introduces the research topic of occupational injury in long–term care (LTC) specifically nonfatal injuries experienced by home–based direct care workers (DCWs). The study focused on examining risk factors for work–related injury, as well as socio–demographic, environmental and organizational factors form a nationally representative sample of home health aides (HHAs). To better understand the context of occupational injury, this chapter discusses the background of the LTC industry and its projected growth in employees and consumers, the historical view of the types of LTC models and the development of employee categories, and the effect of policy and payment reforms, which leads to the study's research questions.

1.1 BACKGROUND

As the population of the United States continues to age and there is a move toward providing elderly individuals with care at home, formal caregivers (DCWs) are in demand. These DCWs provide care in a unique workplace environment, which consists of the patient's home. With a high rate of injuries experienced by this subcategory of healthcare workers in comparison to other industries and occupations, the need to understand the factors associated with such injuries is vital.

However, research assessing risk factors for this workplace is limited. In the United States, LTC has transformed into a complex system due to the changes in the way that care is provided to the elderly and individuals with disabilities. LTC is a component of the medical and social continuum of care, and refers to the provision of support to individuals living with chronic illness and disabilities that require assistance in performing everyday activities. These support services expand beyond traditional medical care and include formal community caregivers, facility providers, and informal caregivers (Feder, Komisar, & Niefeld, 2000; Kaye, Harrington, & LaPlante, 2010; Wysocki et al., 2012).

The current trajectory shows that by 2050, an estimated 27 million individuals will require some degree of LTC and the demand for formal (paid) caregivers employed by home or hospice care agencies is expected to increase (The National Association for Home Care and Hospice, 2008). This increase in demand is anticipated to make formal caregiver jobs (also referred to as DCW jobs) the nation's fastest–growing occupation. As of 2011, there were four million home health and hospice care (HHC) aide jobs; projections estimate a 93% increase by 2020 (R. I. Stone, 2004a). A report from the United States Bureau of Labor Statistics (BLS) and the National Institute for Occupational Safety and Health (NIOSH) noted that healthcare workers were the second–fastest growing sector in the United States. Within this group, the DCW subgroup was identified as yielding the largest increase (United States Bureau of Labor Statistics, 2012e). The Health Resources and Service Administration (HRSA) identifies three main contributors to the increased need for DCWs and LTC services: (a) increased life expectancy of individuals with one or more chronic conditions; (b) aging population and

baby boomers; and (c) increased access and availability of resources within communities (Agency for Healthcare Research and Quality, 2001).

There is a significant relationship between decreased quality of care and life to elderly and chronically ill who require assistance with activities of daily living (ADLs) from DCWs and are unable to receive it. HRSA estimated that when the first baby boomers reach the age of 85, the number of individuals that are 65 years and older will double (Scanlon, 2001; Wing, Langelier, Yamada, Poonthota, & Kumar, 2004). This age sub–group is forecasted to require an increased growth rate of 200% for DCWs (Department of Health and Human Services 2003).

As of 2002, the healthcare industry is considered one of the most hazardous industries (United States Bureau of Labor Statistics, 2002). Of the top five occupations with the highest rates of occupational injuries, nursing aides orderlies and attendants were the second–highest occupation in reported occupational injuries requiring medical attention in 2011, accounting for 20% of total reported injuries (United States Bureau of Labor Statistics, 2012e). Ensuring the occupational well–being of these DCWs is essential to worker health organization success and patient quality of care (P. W. Stone et al., 2007). With the increased need for home–based formal caregivers, it is becoming difficult to ensure their health and safety (Houston, Young, & Fitzgerald, 2013). According to estimates from the United States Depart of Labor, BLS in 2002, 5.8% (79,009) of HHAs, nursing aides orderlies and attendants experienced occupational injuries and illness that required medical attention or resulted in days away from work (United States Bureau of Labor Statistics, 2012d). Even though there is a great demand for DCWs, there is a significant turnover rate (P. W. Stone et al., 2007).

Recruiting and retaining DCWs is challenging, with one factor being their high occupational injury rate. The annual turnover rates for HHC works range from 50 to 75% (Institute of Medicine, 2008; United States Bureau of Labor Statistics, 2012d). According to a 44–state survey conducted in 2003, 80% of states identified DCW shortage as a public health problem. A report published by the American Association of Retired Persons (AARP) identified several studies that reported high vacancy and turnover rates among this workforce category (Gropelli & Corle, 2011). High turnover negatively affects the ability of a facility to provide good–quality patient care and meet the needs of its patients (Hayes et al., 2006; Phillips, 1987; Tai, Bame, & Robinson, 1998).

1.2 LONG–TERM CARE

1.2.1 Hospice Care Model

The word "hospice" comes from the Latin word, "*hospes"*, which was a term used to describe a refuge for travelers. Cediares, in 1000 A. D., is believed to be one of the first people to set up homes for the sole purpose of caring for the terminally ill (Hoffmann, 2005). The basic principle of hospice was to provide humanistic and holistic care (Paradis & Cummings, 1986). The goal was to care, not cure, through the delivery of expert medical care, pain management and emotional and spiritual support for individuals with life–limiting, terminal illnesses as well as for their loved ones. This care, in many cases, is provided at the patient's residence and/or hospice agency, hospital or other LTC agency (National Hospice and Palliative Care Association, 2012). Clinical direct care workers tasked with delivering care to these patients are the core component of the interdisciplinary hospice team, as evident in the mission, goals and objectives of the first hospice established. Furthermore, modern hospice models have identified the importance

of direct care staff through research and strategic management plans (Hoffmann, 2005; Neigh, 2006).

The practice of providing LTC to individuals with life–limiting illnesses in an institutionalized setting began in Dublin and London in the late 1800's and early 1900's, where the first hospices were formed and the need for formal caregivers to provide care began. These caregivers provided patients with emotional and spiritual support during the last few months of life (National Hospice and Palliative Care Organization, 2012; V. Perron & R. S. Schonwetter, 2001). The care workers providing palliative care to patients often lacked the knowledge or skills to discuss death openly. This became one of the factors that fueled the hospice movement (Baer & Hanson, 2000; Buckingham & Lupu, 1982).

Dr. Cicely Saunders'–a 20th century nurse and social worker–research efforts pioneered the hospice movement through the development of the interdisciplinary hospice team concept in the late 1900's. The concept focused on serving the needs and improving the degree of comfort provided to patients with life–limiting illnesses. The movement gained ground through the establishment of the first institutionalized form of hospice (Hoffmann, 2005; V. Perron & R. S. Schonwetter, 2001). Dr. Cicely's lack of clinical experience and medical degree limited her ability to provide care to her patients. Formal caregiver regulation to providing palliative care required individuals to be formally trained to care directly for patients. Therefore, in 1957, Dr. Saunders obtained a medical degree that allowed her to provide palliative care for her patients. She believed that patients who were terminally ill should receive care that had three main purposes: (a) providing care for a patient's total pain, which included mental, spiritual and physical

ailments; (b) the proper use of opioids; and (c) attention to the needs of both the patient and the family members of said patient. The success of the movement resulted in the establishment of hospice agencies worldwide (Hoffmann, 2005; V. Perron & R. S. Schonwetter, 2001; Seale, 1989). Dr. Saunders' idea of hospice care was originally introduced in North America in 1963 at a medical conference at Yale University (Connor, 1998).

The hospice movement spread to the United States in the 1970's. The New Haven Hospice was established in 1974 as part of a demonstration project funded by the National Cancer Institute. Upon its success, the United States Department of Health, Education, and Welfare supported the hospice movement by making funding and grant support available. As a result, hospice agencies began to grow. In 1978, with the help of a government–appointed task force, hospices were determined to be an integral part of the United States Medicare system (Nelda McCall & Korb, 2003a). The greatest expansion of the hospice care industry in the United States occurred due to the passage of the Tax Equity and Fiscal Responsibility Act of 1982. The Act of 1982 made hospice care a Medicare benefit eligible for reimbursement. Medicare hospice benefits and ultimately, home health benefits, were composed of eleven main elements of care: (a) Nursing care; (b) Social work; (c) Counseling services; (d) HHA and homemaker services; (e) Speech therapy; (f) Bereavement; (g) Hospice medications and supplies; (h) Durable medical equipment; (i) Short–term general inpatient care; (j) Short–term respite care; and (k) Continuous care for patient (Paradis & Cummings, 1986; V. Perron & R. Schonwetter, 2001; Torrens, 1985).

1.2.2 Home Healthcare Model

In the United States, the earliest documentation of non–institutionalized home healthcare can be found in 1813 in Charleston, South Carolina (K. Buhler-Wilkerson, 2007b). The wealthy women of Charleston visited patients' homes to provide them with care and comfort. As American cities became highly populated and congested due to the urbanization and industrialization of the twentieth century, the rate of infectious disease increased. The correlation between poverty and illness was evident. Many of the wealthy women in large cities provided financial support to nurses to care for vulnerable people at home free of charge (K. Buhler-Wilkerson, 2007b). A care model was traditionally reserved for wealthy individuals. In addition to caring for the sick and poor, these nurses provided the full continuum of care, which included educating the community on health and palliative care, earning the name "district nurse". The scope of services delivered by these nurses included housekeeping, bathing, feeding and other similar activities (Keating & Kelman, 1988; The Community Health Nurses Initiatives Group of The Registered Nurses Association of Ontario, 2000).

By 1909, over 600 community organizations across the United States (including health departments and hospitals) had developed visiting nursing programs, with a total of 1,413 nurses. Nurses were the primary formal caregivers of home health services. Their primary goal was to mitigate the spread of infectious disease by providing care to ill patients at home. Lillian Ward coined the term "public health nurse" to describe these nurses. Ward was the founder of a New York City community organization called the Henry Street Nurses Settlement House, the first community organization that received payment from a health insurance company for public health nurse services provided to

their policyholders as a health benefit (K. Buhler-Wilkerson, 2007a, 2007b). Her efforts in the home healthcare movement introduced the concept of insurance–based payment.

The care that home health nurses provide refers to the moral responsibilities that these organizations have to provide their patients with medical services that can protect their well–being and alleviate the hurt and suffering caused by medical ailments (Peter, 2002). Research conducted by Williams in 1998 explored how individuals are involved in "creating, living in and being influenced" by their environment (Williams, 1998). Research by Dyck (1995) indicated that a patient's house is often seen as a sanctuary. This has resulted in home health nurses sometimes being seen by patients as companions rather than healthcare workers (Dyck, 1995). In a 2002 article, Varcoe and Rodney (2002) concluded that some of the issues associated with nurses unable to fulfill their duties to patients are rooted within structural, administrative and protectoral bottlenecks (Varcoe & Rodney, 2002).

1.2.3 Role of the Centers for Medicare and Medicaid

The organizational and operational structure of home health organizations remained constant from 1909 to 1965 until the passage of the Medicare Act. This piece of legislation established home healthcare services as a benefit provided by Medicare to its elderly beneficiaries expanding the industry because of the availability of a stable funding source (Grindel-Waggoner, 1999). The combination of multiple policy changes that included but not limited to, the Medicare Act, policies reducing in–hospital length of stay reimbursement, the Omnibus Reconciliation Act of 1980 (removed the limit on the number of home healthcare visits), and the implementation of the hospital prospective

payment system (PPS), resulted in a significant increase in the utilization of home health services (Siddall, 1986).

The passage of the Tax Equity and Fiscal Responsibility Act of 1982, which made hospice care a Medicare benefit eligible for reimbursement triggered a national progression of home health agencies by diversifying its services to provide home hospice care to its patients (Paradis & Cummings, 1986; V. Perron & R. Schonwetter, 2001; Torrens, 1985). This diversification began after the first hospice institution (as we know the term) was established during the mid–1960's. Its success resulted in the establishment of hospice agencies worldwide. Home health agencies expanded to provide home and inpatient hospice services (Hoffmann, 2005; V. Perron & R. S. Schonwetter, 2001; Seale, 1989). This expansion created anxiety amongst patients about the quality of care delivered to them. With the increase in agencies and employees, the need for patient handling requirement and guidelines was evident. As a result, the Centers for Medicare and Medicaid Services (CMS) developed federal health and safety requirements for home health agencies and their workers (Karen Buhler-Wilkerson, 2008).

Home health is an important service for Medicare beneficiaries, but it was feared to have prompted a great deal of fraud due to explosive growth from 1990 to 1996 (Nelda McCall & Korb, 2003a). Access to care issues for home healthcare were a focal point within Medicare. There were a number of policy analyses conducted that concluded that there are problems associated with high–risk patients with respect to the quality and availability of care that they received (N. McCall, Komisar, Petersons, & Moore, 2001). From 1988 to 1996, Medicare spending on home health services increased at an average yearly rate of about 31%, resulting in a 350% increase in Medicare's home health

expenditures (Nelda McCall & Korb, 2003a). Alongside the increase in costs, there was also an increase in the number of Medicare recipients that were receiving medical services under the home health provision.

By 1997, there were approximately 10,444 Medicare–certified home health agencies and one in every ten Medicare recipients used home health service (Hoffmann, 2005; Nelda McCall & Korb, 2003a; Medicare Payment Advisory Commission, 2012b; Peter, 2002). The number of patients and/or Medicare recipients receiving home health services ballooned over 220% during this time period, increasing from 1.6 million to over 3.6 million. The result was an annual expense increase per patient from $1,287 in 1988 to $4,819 in 1996. Even after incorporating a healthcare–related inflationary index, home health services experienced a 14.4% increase over other medical services. Much of this cost increase can be attributed to the Medicare reimbursement system. This reimbursement scheme encouraged HHC agencies to provide services with little or no regard to the associated costs (Peter, 2002). Medicare paid these agencies based on a fee–for–service (FFS) scheme (Nelda McCall & Korb, 2003b; Medicare Payment Advisory Commission, 2012b). A FFS mechanism is a retrospective payment system that requires high levels of administrative oversight, resulting in high overhead costs. There are two types of FFS payments: a fixed payment schedule and a non–fixed payment schedule. Most industrialized countries use a fixed–payment approach; however, the United States employs a payment scheme without a fixed schedule that increases the need for administrative services to navigate the reimbursement system (Barnum, Kutzin, & Saxenian, 1995).

The Balanced Budget Act (BBA) of 1997 included many changes to help control what had previously been unrestricted spending to healthcare agencies that provided home healthcare to Medicare recipients. What transpired was the formation of a prospective payment system (PPS) for the reimbursement of home health services. As the PPS model was being developed, a home health interim payment system (IPS) was immediately implemented to reduce spending. The IPS reduced spending by paying amounts significantly below actual costs (Lin et al., 2005). Once the PPS model was put in place, it created incentives for providers to streamline the methods of providing home health services. This resulted in a reduction of nearly 40% of home health users and 30% of home health visits per use, and 50% of home health payments per Medicare beneficiary (Ahrens, 2005).

With these new amended provisions, the amount of Medicare spending from 1997 to 1999 decreased by almost 50%. This was ultimately attributed to a decrease of 21% in home health users, 41% in the number of visits per user, and 37% in the number of payment per user. As with any type of legislation, there were unintended consequences. In 1999, one result of the BBA was that a third of HHA visits were conducted by nursing aides as compared to about half prior to BBA. In addition, the number of skilled visits grew from two out of five to about half after the passage of BBA. After the passing of the BBA, eligibility for Medicare home health services was strictly limited to homebound, intermittent skilled nursing or therapy services (Nelda McCall & Korb, 2003b).

Once a beneficiary is deemed eligible, Medicare paid for an unlimited number of visits for intermittent or “part time” home healthcare for any of six home health service disciplines with no copayment or deductible. The six disciplines included skilled nursing,

physical therapy, occupational therapy, speech language pathology, medical social services, and HHA (N. McCall et al., 2001; Medicare Payment Advisory Commission, 2000). Overall, these findings concluded that a substantial number of changes occurred; agencies closed and the utilization of home health services decreased. While these appear to have had a negative effect on the overall utilization of home health services, there was no direct evidence indicating that the Medicare population as a whole was adversely affected (N. McCall et al., 2001).

Usage of home health services decreased the most for Medicare beneficiaries in rural areas and areas where state buy–in was needed to provide care to patients. Rather than paying for each unit of service, Medicare paid agencies based on a PPS system where claims were paid based on a fixed amount for each episode of care rather than the services that were actually provided. The PPS system stabilized the rate of cost increase and standardized reimbursement amounts in the home healthcare industry similar to that experienced with other sectors of the healthcare industry (Peter, 2002).

1.3 TYPES OF HOME–BASED DIRECT CARE WORKERS

The United States BLS currently uses the latest 2010 Standard Occupational Classification (SOC) system to categorize and describe the role and duties of each occupation for the purposes of gathering, generating and distributing meaningful data (Khatutsky, Wiener, Anderson, Akhmerova, & Jessup, 2011).

1.3.1 Nursing Assistants

Certified nursing assistants, also referred to as CNAs, include nursing aides orderlies and attendants. As defined by the 2010 Standard Occupational Code (SOC) 31–1012, CNAs help in the delivery of basic LTC to patients primarily in facilities such as

hospitals and nursing and residential care facilities. Approximately 55% of CNAs provide care in a facility setting, whereas only three percent provide care in a home setting. CNAs are supervised and report to a licensed practical nurse (LPN), a licensed vocational nurse (LVN), or a registered nurse (RN). CNAs' job responsibilities require them to execute physically demanding tasks and to spend long period of time standing. Furthermore, CNAs record health concerns, health vitals and in some cases, may dispense medication. Therefore, as the principal caregivers for patients in nursing homes, CNAs typically develop close relationships with their patients (Khatutsky et al., 2011). Similar to CNAs are nursing aides and attendants. Their job duties focus on assisting patients with ADLs, which include cleaning, bathing, dressing, eating and using the toilet (Wright, 2005). Orderlies do not typically provide healthcare services; they assist by providing patient transportation and by cleaning equipment and facilities (Erwin & Okrent, 2012; Paraprofessional Healthcare Institute, 2011; United States Bureau of Labor Statistics, 2012c).

1.3.2 Home Health and Personal Care Aides

Similarly to CNAs, HHAs and personal care aides (PCA) help deliver care to patients who are 65 and older, disabled, chronically ill or cognitively impaired. In 2012, the United States BLS estimated that there were 839,930 HHAs providing care primarily in home settings and 985,230 personal care aides providing care in home and facility settings. Aides' job responsibilities consist of attending to patients' routine, and individualized health needs. They also assist with ADLs and instrumental activities of daily living (IADLs). ADLs provided by an aide include personal care services such as dressing, bathing, feeding, grooming, dressing wounds, applying medications, and

changing bandages. IADL services provided by an aide include helping patients with housekeeping tasks at their homes, such as doing laundry, vacuuming, and scheduling transportation and appointments (Khatutsky et al., 2011; Paraprofessional Healthcare Institute, 2011; Tilson & Gebbie, 2004).

HHAs, as defined by the 2010 Standard Occupational Code (SOC) 31–1011, render healthcare services in a patient's home and are typically employed by Medicaid/Medicare–certified home health or hospice agencies that receive government financial support and are therefore required to follow specific policies and regulations (Khatutsky et al., 2011). Unlike CNAs, a RN must supervise HHAs since they provide medical services to patients. HHAs monitor and record patient conditions, report services performed for quality and billing reasons and notify their supervisor of changes in patients' conditions. To monitor patients effectively, HHAs work with additional medical professionals such as therapists. The extent of medical services delivered to patients by HHAs is limited to basic health services, which includes taking vital signs and applying and administrating medication. HHAs with additional training and certification can use medical equipment to aid patients (Paraprofessional Healthcare Institute, 2011; R. I. Stone, 2004b).

PCAs perform their work in either the patient's home or a nursing facility and include workers such as personal attendants, direct support professionals and home care aides. They help patients stay engaged within their community to increase their quality of life (Erwin & Okrent, 2012).PCAs take care of persons 65 and older, as well as disabled patients and convalescents, helping them accomplish ADLs in home or facility settings. They differ from HHAs in that their job responsibility is mainly to provide

companionship, and not medical care (Khatutsky et al., 2011). In addition to being a companion, PCAs have housekeeping duties, such as preparing meals and cleaning the home (Khatutsky et al., 2011).

1.4 DEFINITION RISK FACTORS

There are multiple types of risk factors that cause occupational injury. A risk factor is defined as any attribute or characteristics of exposure (individual organizational or environmental) that increases the risk of workers to sustain an injury or an illness. Individual risk factors include socio–demographic characteristics of the worker organizational risk factors are related to the organizational structure and environmental risk factors are risks present in the work environment of the worker. The most common and well–documented underlying risk factor of work–related injury among healthcare direct care workers is related to the manual handling of patients. Patients receiving home healthcare services with multiple of severe ADL or IADL needs are functionally limited and require a great deal of physical assistance. The most common types of injuries sustained by this group of workers are Musculoskeletal disorders (MSDs) and back–injuries (Gropelli & Corle, 2011; A. L. Nelson et al., 2007). However, there are other risk factors that also contribute to the increased risk of occupational injury among home–based DCWs and they are examined in this study.

1.5 THE PROBLEM

DCWs are continuously exposed to physically and emotionally demanding job responsibilities through assisting the elderly, the chronically ill or individuals with disabilities with bathing, feeding, or ADLs. DCWs must perform these tasks under unpredictable workplace conditions, such as the patient's home. DCWs are also exposed

to psychosocial hazards, both physical and psychological (Meyer & Muntaner, 1999; P. W. Stone et al., 2007; Zontek, Isernhagen, & Ogle, 2009). Physical hazards, specifically nonfatal worker–related injuries, occur often in the LTC setting. LTC workers experience work–related injuries as a result of their work environment and patient interactions. In home heath settings, DCWs are at risk for injury due to the inability of the employer or worker to control unforeseen hazards in the work environment (the patient's home) (Stonerock, 1997).

Work–related injuries sustained by home–based DCWs have perpetual concerns in the home healthcare industry. These injuries result in a significant reduction in worker and organizational productivity, quality and performance, as well as an increase in associated turnover costs (Hayes et al., 2006; P. W. Stone et al., 2007). Even with the implementation of workplace injury and illness prevention programs, DCWs still experience above–average incidences of injury at 424 per 10,000 full time employees as compared to a national average of 117 per 10,000 full time employees (Leff, Hagenbach, & Marn, 2000; United States Bureau of Labor Statistics, 2012d, 2012e; United States Occupational Safety and Health Administration, 2012; Wipfli, Olson, Wright, Garrigues, & Lees, 2012). The increased demand for home–based DCWs and the high rate of occupational injuries indicates a significant need to identify the factors contributing to such injuries.

Healthcare research on injuries has generally focused on stress and ergonomic position(s). Injuries that are related to stress have been caused by certain factors associated with the workplace environment. Williams (1988) found that psychosocial stress factors among hospital workers have a direct effect on injuries reported by clinical

staff. The amount of psychosocial stress that hospital clinical workers have been encountering has steadily increased over the last ten years (Salminen, Kivimaki, Elovainio, & Vahtera, 2003; Williamson, Turner, et al., 1988). Many of these stressors were found to be caused by increases in workload, administrative duties, and patient involvement. A 2011 study found that high psychological distress was associated with a 5% probability of injury among nursing staff. It was further concluded that effective occupational health programs that helped mitigate mental fatigue and stress in addition to workplace safety programs had the ability to improve the productivity of nurses and other related health professionals (Vecchio, Sasco, & Cann, 2003). However, occupational injury census data consistently indicates that strains, sprains, back injuries and MSDs are the most common types of injuries sustained by home–based DCWs due to patient handling and overexertion (United States Bureau of Labor Statistics, 2012b).

Furthermore, the education and training received by home–based DCWs varies greatly in competency level, topic, length and comprehensiveness making it difficult to assess the effectiveness and adequacy of overall training received by DCWs across different states. However, all training programs cover worker safety that includes patient handling and use of lifting devices. However, data from the United States BLS and prior studies showed that most work–related injuries that resulted in missed workdays involved handling patients (United States Bureau of Labor Statistics, 2012b). Several assumptions have been made to explain the discrepancies between training and DCWs' job and responsibilities. One assumption was that one or a combination of agency and home DCWs' characteristics affects unsafe behavior.

A prominent researcher in occupational health nursing defined five categories of occupational hazards for healthcare workers: (a) physical; (b) biological; (c) environmental; (d) chemical; and (e) psychosocial (Rogers, 1997). According to nationally representative data collected and analyzed by the National Institute for Occupational Safety and Health, healthcare workers are exposed to a wide range of work–related injuries and illnesses and the rate of these nonfatal injuries has continued to rise for over a decade (Department of Health and Human Services, and National Institute for Occupational Safe, 2010). Thus, focusing on a few sets of risk factors is incomplete and has therefore generated the need to examine this workforce group in a holistic way. Based on the nature of the care service delivery by home–based DCWs, biological hazards (i.e., needle sticks) and chemical hazards are minimal because home–based DCWs do not administer any medication or use syringes. Most important with respect to this research is the need to examine work–related injury through: (a) profiling home–based DCWs; and (b) identifying the existing relationships between documented risk factors and the risk of sustaining commonly reported work–related injuries among home–based DCWs. The study focused on socio–demographic, environmental and organizational risk factors.

1.6 RESEARCH QUESTIONS

The purpose of the research is to examine how workplace and employee–level characteristics predict the probability of direct care workers reporting one or more work–related injuries via exploring the relationship between workplace environment (leadership style, work value, time pressures work design and organizational culture) and processes (training). The four research questions are as follows:

1) What different types of occupational injuries and severities that are reported by home–based DCWs?

    a) How do injury patterns vary by personal characteristics (e.g., race, education, hold multiple jobs, etc.)?

    b) How do injury patterns vary by the place of care delivery (e.g., patient homes only, one or more inpatient facilities only or both)?

2) What is the relationship between home–based DCW training and (a) the probability of reporting one or more work–related injuries and (b) the degree of injury severity?

3) What is the relationship between workplace environment (measured by workers' perceptions of leadership style, work design and organizational culture) and the probability of reporting one or more work–related injuries?

4) What is the relationship between ergonomic workplace factors and the probability of reporting one or more work–related injuries?

CHAPTER 2

LITERATURE REVIEW

In this chapter, the theoretical basis of socioeconomic and demographic characteristics, training, perceived work environment and ergonomic factors in relation to the risk of occupational injury are outlined for home–based direct care workers (DCWs). Due to limited availability of research that specifically addresses home–based DCWS and even limited research on home–based DCWs and occupational injury, supporting studies were borrowed from the field of nursing and institutional–based DCWs due to the similarity within individual organizational and social characteristics. Furthermore, research on high–risk industrial employees was used to further supplement the literature review and gain understanding on the history of occupational injury and prevention programs. Lastly, an integrated model of causes of accidents, factors contributing to the risk of occupational injury and its severity are discussed, hence, providing the framework that guided the study.

2.1 BACKGROUND

The long–term care (LTC) workforce faces multiple challenges. A key challenge that has become more visible in today's home healthcare industry is the uncertainty of society's ability to respond to the increased demand for home-based DCWs, due to the growing number of elderly individuals with chronic impairments that remain in their homes and require health services (Benjamin & Matthias, 2004). Even though

informal caregivers currently deliver the majority of home care; the demand for formal caregivers continues to increase. Currently, unpaid caregivers, typically family members, or spouses, provide the majority of home care. The demand for formal (paid) caregivers is expected to increase significantly due: a) to the aging of the baby boomers and b) the chronically ill and individuals with disabilities to 54 million individuals projected by 2020 (S L Mcginnis & Moore, 2006). Forecasters anticipate that this increase in demand will soon make paraprofessional jobs the fastest–growing occupation in the country and that the largest increase will be observed among HHAs positions. As of 2012, HHAs held 875,100 jobs in variety of settings, nursing assistants and orderlies held 1,534,400 jobs in home, nursing and residential care facilities and in hospitals and personal care aides held 1,190,600 jobs in a variety of settings, including patients' homes and larger care communities (United States Bureau of Labor Statistics, 2014).

Home–based DCWs work in a high–risk and demanding industry serving individuals–who are not able to function independently– by helping them complete Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs). Furthermore, they must complete physically demanding tasks in potentially unsafe working conditions (Meyer & Muntaner, 1999; P. W. Stone et al., 2007). The job of home–based DCWs require that workers must be able to complete physically demanding activities such as pulling, pushing and lifting 25–145 pounds without the help of lifting devices. Workers must be able to remain standing for 90% of their workday and focus on detail–oriented tasks while being continually interrupted. They are likely be exposed to infectious and non–infectious bodily fluids and exposed to bodily injury and uncomfortable working conditions (Noel, Pearce, & Metcalf, 2000, p. 245).Therefore,

home–based DCWs are continuously exposed to multiple occupational hazards (Zontek et al., 2009). These hazards often present in the home environment (the patient's home) may lead to nonfatal worker–related injuries due to the inability of the employer or home–based worker to control unforeseen hazards in the work environment (Stonerock, 1997). These nonfatal worker–related injuries result in a significant reduction in worker and organizational productivity, and quality and performance (Hayes et al., 2006; P. W. Stone et al., 2007). Even with the implementation of workplace injury and illness prevention programs, home–based DCWs still experience above average incidences of injury, at 158.8 per 10,000 full time employees (Leff et al., 2000; United States Bureau of Labor Statistics, 2012c, 2012e; United States Occupational Safety and Health Administration, 2012).

Few studies have explored each of the impacts that leadership style, worker training and the use of ergonomics principles plays in preventing home–based DCWs work–related injuries (Traci Galinsky, Waters, & Malit, 2013; D. Lee, 2012; Leff et al., 2000). Even fewer studies have specifically examined the impact of ergonomic factors, training preparedness and workplace environment on both reducing hazards and preventing future injuries and results from these few studies that have been conducted lack consistency (Craib, Hackett, Back, Cvitkovich, & Yassi, 2007; McCaughey et al., 2012). Finally, no study to our knowledge has examined the potential associations between HHC perceived environment, personal characteristic, training and ergonomic work factors on the risk of nonfatal worker–related injuries and their severity.

2.2 HOME HEALTHCARE PATIENTS

To understand the profile of home healthcare direct care workforce (responsibilities, challenges and future trajectory), it is critical to begin by exploring the population they serve. Overall, home–based DCWs provide care to the elderly, the chronically ill and individuals with disabilities in a home setting. A significant factor affecting the growth of home healthcare patient utilization is the aging population. The number of people age 65 and older is expected to double between 2005 and 2030 (Institute of Medicine, 2008). In addition, the percent of individuals age 85 and older is estimated to increase up to fivefold by 2050 (Figure 2.1); hence, the increased demand for home-based DCWs (R. I. Stone & Barbarotta, 2010). This period marks the beginning of what is projected to be a major transformation of how care is provided in the United States (R. I. Stone & Barbarotta, 2010).

As the population ages, these elderly individuals will experience functional limitation and increase utilization of hospital services and prescription medication. Cost saving efforts that began in 1980's via reduction of length of hospital stays and early discharge of many patients to home healthcare has driven the increase in the delivery of home healthcare services (United States Bureau of Labor Statistics, 2012c). For example, the average length of hospital stays dropped from 6.4 in 1990 to 4.8 in 2011 (Department of Health and Human Services, 2014; Gage, Morley, Spain, & Ingber, 2009). Therefore, recipients of home healthcare are large, growing and increasing in the frail and elderly. Another cost saving effort was the implementation of the prospective payment system (PPS) in October of 2000. An assessment of the impact of PPS on home healthcare agencies indicated that agencies responded by significantly decreasing the length of

service and frequency of visits for patients. For instance, the average length of service for home healthcare patients dropped from 97.9 days in 1996 to 69.5 days in 2000 (Cheh, 2001).

When benchmarked to the overall population, patients requiring LTC were disproportionately of a much older age and either live alone or with relatives (Feder et al., 2000). Not surprisingly, the majority of home health patients (80%) are older than 65 years of age (A. L. Jones, Harris-Kojetin, & Valverde, 2012). Most patients in the United States prefer to remain at their respective home or residence (Han, Tiggle, & Remsburg, 2008). The Medicare Payment Advisory Commission (MEDPAC) estimated that 3.4 million beneficiaries used 117.6 million home healthcare visits in 2012 (Table 2.1) and that the number of beneficiaries and service utilization pattern will continue to grow in proportion to the elderly population (Medicare Payment Advisory Commission, 2012a).

When compared to the overall population, patients requiring LTC are disproportionately at a lower income level (Feder et al., 2000). Medicare reimburses for home healthcare under multiple types of health insurance benefits (S. Nelson et al., 2011). The payer portfolio of home healthcare is divided into the following percentages: 10.4% for private health insurance, 10.4% for out–of–pocket, 34.2% for federal Medicare (federal), 28.5% for Medicaid (federal and state) and 16.5% for other public (American Medical Association, 2007). Medicare regulates the combination of hours per day and days per week that a beneficiary may receive home healthcare through the patient's predetermined classification. Two classifications of home health patients exist: part time or intermittent code and "full" code. Part time or intermittent skilled care patients are eligible for hospice and home health services, but at a shorter clinical time interval than

full code home health patients. “Full” code patients receive skilled care less than seven days a week or less than eight total hours each day for a time limit of less than or equal to 21 days (S. Nelson et al., 2011). Full code patients are able to receive more days–up to 90 days per reclassification with a larger allotment of hours determined by the home health or hospice agency (American Medical Association, 2007; Han et al., 2008). Therefore, Medicare policies and regulations impact service utilization and care delivery patterns.

In combination with an aging United States population, this population subgroup will drive the demand for healthcare–specifically, home healthcare–and generate several challenges for the healthcare system (Institute of Medicine, 2008; R. I. Stone & Barbarotta, 2010). The socioeconomic, ethnic and racial diversity, increased longevity and increased geographic separation between family members among these baby boomers and older adults causes their health needs to vary significantly, which will add to the healthcare challenges (Institute of Medicine, 2008). Many elderly individuals are diagnosed with one or more chronic conditions and 25% require assistance with one or more ADLs or IADLs (Bayliss et al., 2014; Hootman, Bolen, Helmick, & Langmaid, 2006). ADL limitations refer to difficulty performing (or inability to perform for a health reason) one or more of the following tasks: bathing, dressing, eating, getting in/out of chair, walking, or using the toilet. IADL limitations refer to difficulty performing (or inability to perform for health reasons) one or more of the following tasks: using the telephone, light housework, heavy housework, and meal preparation, shopping or managing money. In addition, many of these chronic conditions encompass traditional physical ailments and a larger number of this population subgroup suffers from chronic

psychological diseases. Therefore, home healthcare service utilization is greater for this segment of the population (R. I. Stone & Barbarotta, 2010).

The utilization pattern for home healthcare services in this elderly population fluctuated with changing polices and payment models. Figure 2.2 shows the percent distribution of Medicare enrollees 65 and over with ADLs limitations during that 17–year span. In the span of 17 years (1992–2009), the percent of elderly 65 and over who have difficulty with one or more ADLs and who used personal assistance services decreased from 30% to 29%. Elderly individuals 85 and over who required assistance with IADL were more likely to utilize personal assistance services than elderly ages 65–75 (Federal Interagency Forum on Aging-Related Statistics, 2010). Home care utilization analysis presented in Figure 2.3 showed that difference in utilization pattern no longer existed as of 2009 and that 65% of individuals 65 and older with one or more IADLs received personal assistance. There may be many factors that can explain this convergence, one suggestion provided by the Federal Interagency Forum is that individuals 65 and older are becoming sicker and requiring assistance (Federal Interagency Forum on Aging-Related Statistics, 2010).

The national need for healthcare workers will increase at a disproportionate rate during the next twenty years. The United States and incorporated territories will need an additional 3.5 million healthcare workers by 2030 to maintain the current worker/patient ratio (Mather, 2007). Even with the anticipated growth in this segment of workers, the high turnover rate attributed to low wages, few fringe benefits, the physical and emotional strain and the high risk for work–related injuries makes it difficult to sustain the needed workforce (Wiener, Squillace, Anderson, & Khatutsky, 2009). Understanding

the underlying factors that contribute to the risk of occupational injury among home–based DCWs will be vital to ensure that the workforce is prepared for the increase in patient volume.

2.3 HOME HEALTHCARE WORKFORCE

DCWs provide health related services to the elderly, the chronically ill and individuals with disabilities in home and facility settings. According to the Health Resources and Services Administration (HRSA), approximately three percent (2.7%) of DCWs provide home health services, 51.9% are employed by a nursing and personal–care facilities, four and half percent are working in residential facilities and 40.9% are in other facility settings (Department of Health and Human Services 2003). The home healthcare workforce is comprised of professionals, informal caregivers and paraprofessionals that supervise, manage, assist and deliver home–based healthcare services to patients who are over the age of 65, living with disabilities or other chronic conditions (United States Bureau of Labor Statistics, 2012c). This dissertation focused on paraprofessional home-based DCWs who occupy 11% of the direct care workforce. The majority of paraprofessional home–based DCWs are home care aides also known as personal care aides (PCAs) and HHAs. They are the second and third fastest–growing occupations in the United States, and projected to grow by 50% in the next ten years (Seavey & Marquand, 2011). To understand their risk for occupational injury, it is important to examine the socioeconomic and demographic characteristics of these workers. Characteristics that are examined below are: Place of care delivery, race, education, age, gender, marital status, health status, number of children in household ≤

the age of 17, primary language, number of current employers, household income, home–based DCWs' training, job experience, time at current job and job turnover.

2.3.1 Types of Home Healthcare Agencies

In general, there are three main types of home healthcare agencies: (a) certified home health agencies; (b) long–term home healthcare programs; and (c) licensed home healthcare services agency that are authorized to delivery formal care to Medicare and Medicaid beneficiaries. Formal care is primarily provided by paraprofessionals, who deliver approximately 80% of paid, hands–on care to patients and are referred to as home–based DCWs (R. I. Stone, 2004b). Occupational categories of home health direct care paraprofessionals are: certified nursing assistants (CNAs), nurse aides (NAs) orderlies, HHAs and PCAs (Erwin & Okrent, 2012; United States Bureau of Labor Statistics, 2012d). In 1987 a total of 108,112 full time equivalent HHC workers were employed. By 1990, the number of workers grew to a total of 146, 958 employed in 7,230 Medicare–certified home and hospice–care agencies (Occupational Safety and Health Administration, 1992). Out of the projected 3.6 million direct care jobs held in 2012, 19% (686,500) were held specifically by home–based DCWs (Table 2.2). According to the United States Bureau of Labor Statistics (BLS), the number of jobs would increase by 67% to 1.1 million jobs by 2022, indicating the importance of addressing these workers' health and well–being (United States Bureau of Labor Statistics, 2012e).

2.3.1 Socio–Demographic Characteristics

The home-based direct care workforce are 44 year old high school educated white non–Hispanic women with children dominate the home–based direct care workforce (Figure 2.4) (Scanlon, 2001; United States Bureau of Labor Statistics, 2012a; Wright,

2005). In the span of 30 years (1970–2004), the proportion of women in the labor force increased by 16%, rising from 43% to 59.2%. Women on average constitute 89% of the direct care occupations and half (51%) are married (Montgomery, Lyn Holley, Deichert, & Kosloski, 2005; Smith & Baughman, 2007; Wright, 2005).

HHAs comprise a large segment of the overall healthcare workforce in the United States, one–third of them lack healthcare coverage. Racial and ethnic minorities constitute 50% of the direct care workforce; 33% are African Americans and 15% are Latinos or other persons of color (United States Bureau of Labor Statistics, 2012a). This racial and ethnic profile was significantly different than that of the mid 1990's where seven out of ten HHAs were white and 29% were black. However, it still remained the same that home–based DCWs are more likely to be employed part time than full time and many of them hold multiple jobs (Crown, Ahlburg, & MacAdam, 1995). Over half (54%) of home–based DCWs held one job in a 2 year period, while 45% held multiple jobs (Bercovitz et al., 2011). Foreign–born workers are estimated to comprise 24% of the workforce (United States Bureau of Labor Statistics, 2012a). A quarter of home–based DCWs speak a language other than English at their home, making English a second language for many of these workers. Most of the patients to whom they provide care speak only English (Montgomery et al., 2005).

Many view the recent influx of foreign workers and recent, first–generation immigrants as a viable source to increase the HHA workforce in the United States (Browne & Braun, 2008; Khatutsky, Wiener, & Anderson, 2010). Immigrants to the United States for either political or family reasons were more likely to be accommodating

to a lower pay scale and more challenging working conditions than citizens who have been in this country for a longer period (Priester & Reinardy, 2003).

Immigration healthcare advocates point to the role that the federal government can play in helping to streamline the process for immigrants willing to work within certain healthcare fields, most notably HHAs. These advocates indicated that policy makers could make available a more systematic approach to change national immigration policy and, therefore, alleviate the current and possible future issues related to healthcare shortages within this country (Khatutsky et al., 2010). Although this solution seems possible, it is by no means without major flaws. Two of the major issues embedded within this proposal are communication and cultural barriers. As expected, many of these immigrants, although able–bodied, are not able to communicate efficiently in English (Khatutsky et al., 2010).

Another issue is related to immigrants who received training to provide home health services. Currently, 41.3% of immigrants indicated that they received their training in a "non–traditional" environment compared with 23.4% of non–immigrants, which could embed issues related to quality of care and possible confusion for not only the patient but also for HHAs and other vested parties (Khatutsky et al., 2010).

Critics of the increased reliance on immigrant labor point to the existing bottlenecks within the industry as ways to mitigate further shortages and lessen the reliance on immigrant labor. These limitations include low wages, fewer fringe benefits and very little initiatives for workers to stay in low–paying jobs (Wiener et al., 2009). However, a study published in 2012 noted that many of these perceived concerns were unfounded because CNAs in nursing homes were older, more mature and better educated

than their non–immigrant counterparts. Thus, an immigrant workforce of an older average age might be more mature and able to handle the stressful work environment present within the home health industry (Khatutsky et al., 2010).

Overall, the wages and the benefits of facility– and home–based DCWs are low and non–comprehensive. The BLS National Occupational Employment and Wage Estimates report showed that in 2002, the average annual wage for the 1,341,650 DCWs was $21,050. It is important to note that this estimate was based on full–year, full time employment , which does not hold true for many employed DCWs and independently employed HHAs (United States Bureau of Labor Statistics, 2002). Table 2.3 showed that as of May 2012, there were 674.7 thousand home–based DCWs consisting of HHAs, NAs, orderlies and PCAs with an average annual wage of $22,810 (United States Bureau of Labor Statistics, 2012e).

Slight improvements in working conditions for HHAs have been evident. A study that used Current Population Survey (CPS) data conducted by Yamada showed that over the past ten years, there has been a positive direct relationship between workers' hourly wages and mean and median family income. The study showed that a slight increase in home health workers' hourly wages from $5.81 to $6.00 (adjusted to 1998 dollars based on Consumer Price Index) has occurred as well as an increase in both mean and median family income (Yamada, 2002). In of 2012, the median hourly wage for HHAs was $9.82 (Table 2.3), which did not significantly change from the prior two years and continuously ranked below the average for all home health workers (United States Bureau of Labor Statistics, 2012e; Wysocki et al., 2012).. Moreover, HHAs noted that having full time appointments is very unlikely because their patient load often did not accommodate a full

time workload. Consistently over the years, between 20–30% of home–based DCWs are employed part time (Bercovitz et al., 2011; Wright, 2005).

The Current Population Survey (CPS) estimated that the average household income for all DCWs was approximately $40,500 and the 2007 National Home Health and Hospice Care Survey estimated that two–thirds of home–based DCWs' household income falls below $40,000 (Bercovitz et al., 2011; United States Bureau of Labor Statistics, 2012a). Not surprisingly, 47% of DCWs live in households at or below the federal 200% poverty level based on income (Paraprofessional Healthcare Institute, 2013). The home–based direct care workforce is more likely to receive assistance from government programs such as Supplemental Nutrition Assistance Program (SNAP) and Medicaid than the general workforce (Scanlon, 2001). In many cases, home- and facility-based DCWs, supplement their income with food stamps and other governmental assistance programs based on their eligibility criteria. Twenty eight percent of the direct care workforce lived under the federal poverty line and qualifies for government assistance program benefits and over 20% did not hold a high school diploma (Himmelstein, Lewontin, & Woolhandler, 1996; Wing et al., 2004).

In the late 1990's, approximately 22% of HHAs were living in poverty compared to 16% of nursing home aides (Harris-Kojetin, Lipson, Fielding, Kiefer, & Stone, 2004). In 1999,34% of nursing home and 45% of home–based DCWs earned less than $10,000 per year; 40% lived below the federal poverty line and were single parents and 35% received food stamps (Scanlon, 2001; Yamada, 2002). As of 2007, over half of all DCWs (facilities and home settings) were currently receiving or had benefits from at least one of these government assistance programs: Temporary Assistance for Needy Families

(TANF), Special Supplemental Nutrition Program for Women, Infants and Children (WIC) or SNAP; ten percent were currently receiving benefits and five percent were receiving housing assistance (Bercovitz et al., 2011). In 2011, approximately 25% of HHAs and CNAs were on cash welfare benefits for families and children and about 42% were SNAP recipients (Khatutsky et al., 2011).

2.3.2 Training

Before beginning any job, training is typically administered to ensure the employee's ability to perform the duties. The same logic applies to DCWs, whereby they receive training on either a state or agency level–depending on each state's and agency's policies. The most readily incentivized approach to increasing worker safety and decreasing the number of work–related injuries is training. Training has been used for many years as the basis for work–related injury–prevention programs. The main goal of these prevention interventions is to prevent work–related injuries and eliminate DCWs' unsafe behaviors (D. Brannon, Zinn, Mor, & Davis, 2002; Service Employees International Union, 1995). Since home healthcare services became reimbursable under Medicare and Medicaid, certification training for home–based care workers has been implemented to meet the Centers for Medicare and Medicare Services (CMS) standards (Fishman, 2004). The certification training curricula vary greatly in topic, length, and comprehensiveness; nevertheless, all training programs cover worker safety, which includes how to handle patients who require mobility assistance. However, data from the United States BLS and prior illustrated studies showed that most work–related injuries that resulted in missed workdays involved handling patients (United States Bureau of Labor Statistics, 2012b). Several assumptions have been made to explain the

discrepancies between training and DCWs' job and responsibilities. One assumption was that one or a combination of agency and home DCWs' modifiable and non–modifiable characteristics affect unsafe behavior.

Direct care workers primarily provide the care that HHC patients require and account for 80% of all billed hours (Montgomery et al., 2005). Traditionally, direct care or HHAs received little or no training before starting their jobs. In all LTC settings, the direct care workforce consists of uncertified or low–level–certified DCWs. Federal regulations require a NA or a HHA to have less than 2 weeks of training or 75 hours of training and pass a third–party orientation. By law, aides are allotted a total of four months of active work experience before the required examination and he or she must meet educational requirements (United States Department of Health and Human Services, 2002).

Federal regulations do not require any level or length of training, and the minimum amount of time that an aide must train ranges by state, which makes it difficult to standardize and study home-based DCWs training (Wing et al., 2004). However, most states have developed and implemented additional requirements, specifically for HHAs.

Some states have developed certification and training programs for DCWs. The minimum federal requirement for home–based DCWs training is 75 hours including 16 clinical hours. As shown in Figure 2.5, 34 states and the District of Columbia met by that requirement. Thirty states exceeded the federal minimum requirements requiring training programs to be 76–120. Only six of these states required the recommended hours by the institute of medicine (IOM) of 120–hours and another 14 states required clinical hours ranging up to 80–hours (Dawson & Surpin, 2001). In North Carolina, training programs

are offered through local community colleges and public high schools throughout the state. These colleges educate DCWs and evaluate them on a specific set of competencies (Freund et al., 2004). In New York, to obtain a home–based DCWs training certification, individuals must complete a 75–hour training program that included a 16– hour basic core curriculum that is required for all paraprofessionals (Rodat, 2010).

In addition to training and education, job competency has influenced the level and quality of care given to patients. This job exposure refers to both length of service as a home–based DCW and length of service with an employer. The 2007 National Home and Hospice Care Survey (NHHCS) estimated that only 19% of home–based DCWs were new to this occupation and have less than a year of work experience. Approximately 50% of home–based DCWs had 11 or more years over all experience in the field of home healthcare and another 20% had between six to ten year experience (Bercovitz et al., 2011).

Job tenure alludes to the level of experience home–based DCWs have with dealing with patients and familiarity with the agencies' policies and regulations. An anthropological study by Henderson (1994) explored DCWs' job through becoming employed as a direct care worker for approximately one year (Henderson, 1994). Henderson (1994) explored and analyzed the effect of the job experience on DCWs' knowledge and skills. One of Henderson's (1994) key findings was that aides were aware of their patients' personal habits and used this awareness to provide care in an efficient way. Furthermore, even though aides did not possess medical training and had limited training, they had important knowledge about their patients, and their medical needs that were obtained through their hands–on tasks. Even with the lack of skills and training to

reach their full potential, DCWs typically acquired knowledge regarding their patients that may lead to providing better care if their knowledge is integrated into the current system and utilized in making decisions regarding patient care (Zinn, Brannon, & Mor, 1995).

2.3.3 Turnover

In addition to low wages, limited benefits and expanding care gap, the recruitment and retention of direct care workers is a major workforce problem. The turnover rate is significantly high within the direct care workforce and career advancement is constrained. This global problem has shown to have a negative impact on patient care organizational environment (both culture and climate) and overall healthcare systems (P. W. Stone et al., 2003). In addition, workforce development opportunities are restricted because of the brief existence of this career field. Within the literature, the rates of turnover were not computed consistently across multiple studies and subcategories of DCWs. Even though measurement inconsistencies are apparent, many studies have reported that turnover rate in the direct care workforce is greater than 50% (Paraprofessional Healthcare Institute and North Carolina Department of Health and Human Services' Office of Long Term Care, 2004). In a national representative survey conducted in 1999 by the North Carolina Division of Facility Services, 88% of states identified nursing aid recruitment and retention as problematic in the direct care workforce. Approximately 71% had taken action to mitigate the issue and 19% had not (Cramer, Harmuth, & Gamble, 1999).

According to a report published by the Paraprofessional Healthcare Institute, the major factors causing high turnover rates and low retention and recruitment are:

- Low wages
- Limited benefits
- Limited and/or insufficient training and education
- Little to no opportunities for career advancement
- Lack of value for the work provided by others
- Lack of involvement in patient–care decisions

All of these factors have been shown independently to have an impact on turnover rate, although the presence of several if not all of them within the direct care workforce significantly contributes to the overwhelmingly high turnover rate (Paraprofessional Healthcare Institute and North Carolina Department of Health and Human Services' Office of Long Term Care, 2004). The issues of low retention, recruitment, and high turnover rate have captured the attention of many national and state studies to collect information targeting DCWs. This has resulted in the identification of discrepancies between the occupational classifications of HHAs, nursing aides, attendants, and orderlies. These discrepancies hinder the ability to accurately compare data and study results across multiple disciplines.

2.4 OCCUPATIONAL INJURY

Occupational injury is defined as any condition of physical injury sustained by an employee related to performing work duties and responsibilities in the workplace. The employee is often involved as either the agent or victim of the injury. There are two main categories of occupational injury: fatal and nonfatal. Fatal occupational injuries are injuries that result in worker mortality. However, the study only focused on nonfatal occupational injuries, which denotes that the injuries sustained resulted in missed

workdays or required medical treatment (Wing et al., 2004). Injuries are then sub–classified according to the nature of the injury, part of the body affected and severity.

As healthcare is the largest industry in the United States, with an 8.8–million–person workforce and anticipated continuous growth, one might assume that healthcare organizations provide high occupational health to workers based on the nature of the work delivered by the industry; however, this is not the case. Throughout the late 1980's and early 1990's, researchers recognized the lack of proactive effort in the healthcare industry to mitigate workplace hazards for home–based employees (United States Bureau of Labor Statistics, 2012b). A total of 291,000 occupational injuries were reported in 1984 across all industries and 11,000 of these injuries were reported by healthcare workers (Emmett & Baetz, 1987; Zenz & Dickerson, 1994). In 1990, the Department of Labor estimated that approximately 4.5 million healthcare workers (4% of the workforce) were employed in hospital setting (United States Bureau of Labor Statistics, 1984, 1990, 2012b). In 1993, the reported incident rate of occupational injuries among healthcare workers was greater than that of mining, as there were 10.9 healthcare injuries and 7.5 mining injuries per 100 full time employees (Occupational Safety and Health Administration, 1992).

Data from the United States BLS identified three industries with incidents exceeding 100,000 annually: healthcare and social assistance (168,360), manufacturing (125,280) and retail trade (125,650). In healthcare and social assistance, 42% of incidents led to MSDs, equivalent to a rate of 55 cases per 10,000 full time employees, which is 56% higher than that of all private industries. Healthcare workers also experienced a three times greater rate of violence and other injury incidents–15 cases per 10,000 full

time employees– than other industries in the United States. The nature of work responsibilities of healthcare DCWs requires a high degree of human–to–human interaction. As a result, more than a third of occupational injuries reported by healthcare DCWs involved another person, often a patient (28%). This illustrates the significant association between patient handling and occupational injury (National Safety Council, 1993, 2013; United States Bureau of Labor Statistics, 2012b). These high incident rates ranked the healthcare industry as the fourth highest out of 12 service industries. Within the healthcare workforce, paraprofessional DCWs had a higher rate of injury than professional DCWs and the national average (Table 2.4). These estimates resulted in the healthcare industry being labeled as a hazardous industry by the United States Department of Labor in 2002 (United States Bureau of Labor Statistics, 2012b).

It is difficult to examine the nonfatal occupational injury rate, specifically of home–based DCWs employed in the home healthcare industry apart from other home health workers employed by other industries. However, from examining the general trends of occupational injuries within the home healthcare industry as well as HHAs employed outside of that industry, it is clear that nonfatal occupational injury is a problem. In 2001, home–based DCWs, specifically NAs, orderlies and attendants, were ranked the second–highest occupation for work–related injuries, with a total of 71,017 injuries that required medical attention or caused days away from work. Nearly 57% of all injuries documented occurred during the care of a patient. Sprains and strains accounted for 63% of injuries, while 54% were associated with overexertion (Institute of Medicine, 2008; P. W. Stone et al., 2007). Approximately 11% of workers who reported

an injury reported at least one lost workday. In 2012, the average length of lost work days due to injury was nine days (United States Bureau of Labor Statistics, 2012b).

In 2002, Occupational Safety and Health Administration (OSHA) published data depicting the different types of injuries reported by DCWs and the frequency of their occurrence. The three most frequently reported categories of injury were sprains and strains, pain and soreness and bruises and contusions at 62.9%, 13.4% and 62%, respectively (United States Bureau of Labor Statistics, 2012b).

2.5 REPORTING BARRIERS

Estimating the number of DCWs employed in home healthcare settings is difficult and the total number of home healthcare workers has not been well established. There are multiple factors that contribute to the lack of accurate estimates. One key factor is that data has been collected on the number of full time equivalent workers employed in Medicare–certified HHC agencies in national surveys. Many home and hospice–care aides are employed on either a contingent or part time basis and work in agencies that are not Medicare certified, which means that the actual number of total aides is greater than reported. It is difficult to estimate the number of non–Medicare–certified home healthcare agencies due to variations among states in licensing requirements.

A study published in 1992 approximated that there were 12,497 HHC agencies in the United States and only 57% were Medicare certified. Medicare–certified agencies are typically surveyed to gather workforce information, excluding non–certified agencies (Institute for the Future of Aging Services, 2007; Montgomery et al., 2005; United States Occupational Safety, 1992). Data from the National Home and Hospice Care Survey and the National Center for Health Statistics indicated in Figure 2.6 that in 1992, there were

7,000 home healthcare agencies and 85% were Medicare–certified agencies. By 2000, the number of home healthcare agencies decreased to 9,400 and approximately 76% were Medicare–certified agencies. This indicated that for the span of eight years, an average of 20% of home healthcare agencies were not certified by Medicare and were not represented in the literature data (A. Jones & Strahan, 1997; A. L. Jones, Moss, & Harris-kojetin, 2000; National Center for Health Statistics, 1992-2009; Strahan, 1993).

Therefore, it is likely that the accurate rate of work–related injuries within the home healthcare sector is significantly higher than reported. Many experts believe that the estimated figures of occupational injury rate among home–based DCWs is significantly underreported because many of these workers believe that injury is part of the job and is to be expected (A. L. Nelson et al., 2007). A study of hospital clinical staff reported that 39% of employees do not report an injury because they perceive it to be minor, but the study identified that 64% of these unreported injuries in fact required medical attention and 44% resulted in lost workdays (Weddle, 1996). The American Nurse Association conducted a survey in 2001 and reported that only 25% of injured nurses report work–related injuries. The study's survey results showed that the reasons for the lack of reporting were: (a) fear of termination or possible disciplinary action; (b) fear of harassment by others; (c) possible reason for inability to receive promotion or career–advancement opportunities; and (d) possible development of a bad reputation among colleagues, patients or supervisors (Janiszewski Goodin, 2003; Weddle, 1996).

Multiple studies on the occurrence of needlestick injuries among hospital clinical staff and the effect of workplace climate showed that three out of four needlesticks go unreported. Even though the risk for needlestick injuries is rare among HHAs, injury-

reporting patterns are similar (De Castro, 2003). Using unionized non–hospital RNs employed in New York State institutions, Gershon and his associates (2009) examined the risk of blood and body fluid exposure. The study design used the Nurses Association and New York State Public Employees Federation registry to disseminate a self–administered questionnaire to a random stratified sample. The survey results showed that in a 12–month period prior to the study, nine percent of respondents reported being injured via a needlestick at least once and that the percutaneous injury rate was 13.8 per 100 person years. The study finding suggest that four out of ten total incidents are reported through formal channels (Robyn RM Gershon et al., 2009). Furthermore, the study described in Gershon and associated (2007) published work estimated underreporting to account for approximately half of the percutaneous injury rate and only 30% received appropriate post–exposure treatment. Respondents identified time restrictions, fear and lack of awareness of reporting policies as the key factors to barriers of reporting incurred sharps injuries (R. Gershon et al., 2007).

2.6 HAZARDS

Employed individuals spend an average of one–third of the day at work, which has a direct relationship with their health and safety. In the work environment, employees are exposed to hazards that can affect their likelihood of sustaining a work–related injury. Historically, occupational hazards within the healthcare industry have four main classification that may pose harm to a worker upon exposure and are potentially preventable: (a) biological; (b) chemical; (c) ergonomic and physical; and (d) psychosocial (Clarke, Rockett, Sloane, & Aiken, 2002; Clarke, Sloane, & Aiken, 2002a, 2002b).

2.6.1 Biological

Blood–borne pathogens and infectious diseases are abundant in the workplace of home health DCWs; that is, the patient home environment. However, in a home environment, the employer and the home healthcare worker are limited in their ability to implement and monitor quality control and risk–management measures as in an institutional setting (Berger & Anderson, 1984; DiBenedetto, 1995; Emmett & Baetz, 1987; Lowenthal, 1994; Rogers & Haynes, 1991; Tan, 1991; Triolo, 1989a, 1989b; Williamson, Selleck, et al., 1988; Williamson, Turner, et al., 1988). On the other hand, institutional settings have better established surveillance and reporting policies and procedures than home environments (Lorenzen & Itkin, 1992). Exposure to blood–borne pathogens and infectious diseases typically occurs in the healthcare industry through needlestick and sharps injuries. The National Institute for Occupational Safety and Health (NIOSH) estimated that with six to eight million individuals employed in a healthcare agency in the United States, approximately 800,000 needlesticks and other sharps injuries occur every year (National Institute for Occupational Safety and Health, 1999). Skin penetration by contaminated sharp objects may transmit pathogens/infections such as human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV) to the healthcare worker, posing a possible threat to their safety. Among exposed healthcare workers, approximately 0.25% to 0.40%, 6 % to 30% and 0.4% to 1.8% will test positive for HIV, HBV and HCV, respectively (Scharf, McPhaul, Trinkoff, & Lipscomb, 2009, p. 275). Preventing accidental needlesticks and sharps injuries reduces the potential of exposure to blood–borne pathogens among home DCWs.

2.6.2 Chemical

Many chemical, pharmacological, and cleaning agents are present as hazards to healthcare workers, but many of these agents are not present in the home setting and do not pose a hazardous threat. However, the risk of exposure to antineoplastic agents is probable because they are commonly used when caring for home healthcare patients. Antineoplastic agents' lack of proper disposal was found to be an underlying problem in exposure. Up to 90% of home healthcare nurses were not following proper precaution protocols and were disposing of wastes down the drain in patient homes (Crudi, Stephens, & Maier, 1982). Other potential hazardous chemicals present in the home for personal use by the patient may lead to risk of home–based DCW exposure. Such chemicals include but are not limited to pesticides, herbicides, insecticides, and chemicals associated with home activities. Even cleaning supplies that are typically found under the sink can be hazardous if used improperly (Laramie, Firsova, & Davis, 2007; Laramie, Pun, Fang, Kriebel, & Davis, 2011; Scheckler et al., 1998; Vaughn et al., 2004).

2.6.3 Ergonomic and Physical

Home–based DCWs are at risk of experiencing physical injury due to ergonomic and physical hazards present in their work environment. Ergonomic and physical hazards are duties and responsibilities of home–based DCWs that require them to perform repetitive motions, use physical force and be in twisted or awkward body positions. A large portion of worker compensation claims in both the institutional and home environments were a result of ergonomic–associated injuries such as strains, sprains, and MSDs (Markkanen et al., 2007). Unlike in a hospital setting, the physical environment in patient homes is not under the DCW's control, which limits the availability of safety

measures such as maintenance staff and lifting and assistive devices to prevent ergonomic and physical associated injuries (Quinlan & Bohle, 2008; United States Occupational Safety and Health Administration, 2012). The most common type of injuries recorded in the literature were MSDs and back injuries and the most disabling type of injury is overexertion, at a rate of 50 per 10,000 full time equivalent workers (Liberty Mutual Research Institute for Safety, 2012). The main hazards that led to those reported injuries were patient handling, slips, trips and falls (Robyn RM Gershon et al., 2009). The 2002 data from the United States BLS showed that half of injuries were due to DCWs' overexertion and half of these involved a patient (United States Occupational Safety and Health Administration, 2012). In fact, patient handling was the underlying cause of ergonomic–associated injuries (United States Bureau of Labor Statistics, 2012b). Approximately 33% of injuries reported by home–based DCWs involved patient handling. As stated earlier, in 2012, the home health service industry encountered 7,830 cases of nonfatal occupational injuries and illnesses involving days away from work and 2,960 involved an injured patient (Markkanen et al., 2007; United States Bureau of Labor Statistics, 2012b).

2.6.4 Psychosocial

Consistently, psychosocial hazards have been linked to a wide range of employees' health disorders and issues with well–being. The concept of psychosocial hazards and risk factors at work is difficult to examine, since it relies on employee perceptions and experience and requires the involvement of many moving components. Thus, its definition must be broad to account for multiple influences and their effects, both intrinsic and extrinsic to the job. Workplace psychosocial hazards are the outcome

of associations between and among environmental– organizational– and individual–level components that may, through employee perceptions and experience, influence employee health and well–being, work performance and job satisfaction. Psychosocial stresses include but are not limited to mental and physical overload, job insecurity and ambiguity, poor work design, violence and unsafe working conditions. The dynamic interaction between environmental and human factors in relation to organizational factors is of occupational concern due to its potential contribution to the risk of experiencing psychosocially related injuries and is presented in Figure 2.7 (Joint ILO/WHO Committee on Occupational Health, 1984).

Violante and associates (2004) examined psychological factors and work–related back injuries, specifically chronic back pain, acute back pain and diagnosed lumbar disc hernia, within the direct care workforce in 2004. The study tested Karasek's demand–control model by examining job satisfaction and specific psychological factors that included stress–related psychosomatic symptoms, depression, coping mechanisms and work environment (Karasek Jr, 1979). The study described the results of a self–reported questionnaire administered to 858 female hospital nurses. During a 12–month period, approximately 44% of the nursing staff experienced some type of back disorder. Nurses who did not report having back disorders had lower scores for all psychological factors while controlling for individual–level characteristics, including but not limited to body mass index (BMI), sporting activities and prior back disorders (Violante et al., 2004).

Several studies have conducted surveys to identify the nature and prevalence of hazards to home–based DCWs. Household hazards that may pose a threat to the safety of home–based DCWs are listed in Table 2.5. In summary, the most prevalent hazards

present in home–based DCWs' work environment were: (a) ergonomic; and (b) physical hazards. These hazards increased the risk of slips, trips and falls were reported by home–based DCWs. Organizational characteristics that presented hazards to home–based DCWs included poor staffing and lack of safety equipment and devices for patient handling. A review of these studies identified three main perceived hazards that can potentially cause work–related injuries, which are: (a) lifting, pulling and pushing patients; (b) possible resident violence; and (c) exposure to infectious diseases (Robyn RM Gershon et al., 2008; Kerm Henriksen et al., 2008; Markkanen et al., 2007; Sofie, 2000).

2.7 PREVENTION

Due to the high injury rate within the direct care workforce, who includes home–based direct care workers, the OSHA has urged the development injury–prevention interventions. In 1999, the rate of work–related injury in nursing homes was 13 injuries for every 100 full time employees, which was significantly higher than the construction industry's rate of eight injuries for every 100 full time employees (Scanlon, 2001). Therefore, in 2002, OSHA implemented a National Emphasis Program that focused on LTC agencies to reduce the frequency of reported work–related injuries. The program entails inspecting any organization that reports over 14 injuries for every 100 full time employees that resulted in missed workdays, temporary disability or limited activities. This program led to approximately 2,500 LTC facilities being contacted for possible investigation (United States Occupational Safety and Health Administration, 2012). By 2004, LTC facilities remained part of OSHA's program due to continued high reporting of work–related injury rates (Snare, 2005).

OSHA's efforts pushed for the implementation of comprehensive occupational programs to address employee health and have encouraged research to identify methods to reduce occupational injury of employees by identifying associated risk factors. An integrated model adapted from multiple models that predicted worker safety, individual characteristics, and system–level safety was developed and presented by Gershon and associates in their 2008 published work. The model is presented in Figure 2.8 and shows the pathway and connection between the above four hazards and the risk of adverse events (i.e., occupational injury). The authors determined that organizational, residential (workplace environment) and individual characteristics are linked to the risk of adverse events (Robyn RM Gershon et al., 2008).

2.8 RISK FACTORS

Within all four occupational hazards, there are factors that place the healthcare worker at risk for injury and thus are reported to the organization. These risk factors are referred to as "occupational risk factors". In this study, the main occupational risk factors that will be examined in depth are the worker's: (a) socioeconomic and demographic characteristics; (b) training; (c) perceived work environment; and (d) ergonomic factors (availability of lifting devices). Examining the literature, it is evident that there is a large pool of information and research on occupational injury risk factors of healthcare workers that provide care within an institutional environment (United States Bureau of Labor Statistics, 2012e). However, a limited number of research studies have focused on occupational injury risk factors of home–based direct healthcare workers that provide care outside of an institutional environment, such as the patient home. Home health workers might experience similar risks to their institutional bound counterparts because

of the similarities in the health status and demographic composition of the patients they serve. However, there are additional risks experienced by home–based DCWs due to the inherited nature of their workplace environment (patient homes).

Home–based DCWs perform tasks that are physically, mentally and emotionally demanding in an uncontrolled, unpredictable, high–stress work environment that may involve uncooperative patients and shortages in staffing and resources (Behling & Guy, 1993; Markkanen et al., 2007). In addition, they often work independently with little to no availability of access to assistance, lifting, or other safety equipment, with no direct supervision and having to deal with family members. The presence of these factors as a whole fosters an environment with a high risk of injury (DiBenedetto, 1995; Quinlan & Bohle, 2008). Several studies were identified in the literature that has specifically examined relationships between organizational, residential (workplace environment) and individual characteristics and occupational–safety outcomes in the home healthcare sector. The occupational–safety outcomes in the studies examined included percutaneous injuries, back injuries, and MSDs.

2.8.1 Socio–Demographic Characteristics

Examining the characteristics of injured employees, a pattern of socioeconomic and demographic factors emerged. These factors include advancing age, long work hours, history of injury, poor health status, lack of wellness activities and female gender (De Castro et al., 2010). Some studies that have identified a relationship between worker–level characteristics and occupational injury are discussed below. These worker–level characteristics included social maladjustment traits, cognitive ability, employee age and job experience (Hansen, 1989).

2.8.1.1 Age

The United States workforce has seen a change in its age group distribution whereby the number of workers older than 55 doubled in the years between 2002–2012 (DiCecio, Engemann, Owyang, & Wheeler, 2008; Fullerton Jr & Toossi, 2001; Toossi, 2012). According to NIOSH, older workers report significantly fewer work–related injuries in comparison to their younger counterparts. However, injuries sustained by older workers are at a higher level of severity and resulted in a higher rate of fatalities (Department of Health and Human Services, and National Institute for Occupational Safe, 2010, 2013; Richardson, Ruser, & Suarez, 2003). Grandjean (2006) conducted a retrospective study of occupational injury and linked predictive factors at a mid–Atlantic regional trauma center between 1998 and 2003. The study focused on identifying the risk and severity of occupational injury among workers older than 55 years of age. Severe injuries are defined by the Centers for Disease Control and Prevention as traumatic injuries that occur in the workplace suddenly and are either fatal or require immediate medical attention. Between 1998 and 2003, approximately 12,000 patients had experienced a work–related injury and received treatment at the mid–Atlantic trauma center. A total of 250 patients experienced a high severity injury with an average hospital stay of ten days and approximately a quarter (n = 64) were patients 50 years of age and older (Grandjean et al., 2006). Another study that examined the association between physical job demands, age and risk for work–related injury found that workers with a physically demanding job (similar to the tasks performed by home–based DCWs) and 45 years of age and older had higher injury risk than workers 30–44 years of age. In

addition, workers 45 years of age and older were 3.5 times more likely to experience work–related injury due to MSDs (Chau, Bhattacherjee, Kunar, & Lorhandicap, 2009).

2.8.1.2 Employment Status and Tenure

The nature of the work and workplace environment of home healthcare and hospice RNs places them at an increased risk of exposure to blood–borne pathogens. Therefore, in 2006, a self–administered survey was mailed to 1,473 HHC nurses in the state of North Carolina to assess those risks. The survey's adjusted response rate was 69%. The researchers analyzed all 833 respondents and found that nine percent reported one or more exposures to blood and body fluids. The researchers identified a significant association between nurse longevity of employment, full time status and risk of exposure. Nurses working in home healthcare for up to five years were at a higher risk of exposure to blood–borne pathogens than nurses working for more than five years were. The odds of exposure via needlestick injury were seven times greater and via non–intact skin exposure were three and a half times greater for those nurses employed five years or less. There were seven part time nurses in home and hospice care and they were one and a half times more likely to be exposed to blood–borne pathogens via needlestick and non–intact skin exposure (Department of Health and Human Services, and National Institute for Occupational Safe, 2010; Jack K Leiss et al., 2009; Myers, Jensen, Nestor, & Rattiner, 1993).

2.8.1.3 Health Status

According to HRSA, lifting, pulling, or pushing residents' causes many of DCWs' work–related injuries. These actions cause sprains and strains, pain and soreness or bruises and contusions, which are typically, categorized as MSDs (United States

Occupational Safety and Health Administration, 2012; Wing et al., 2004). The majority of the time, DCWs complete patient lifts independently without anyone's assistance. On average, they lift over 10,000 pounds per shift, equivalent to 40 lifts of approximately 260 pounds (Kane, 1989; Scalia, 2001; Secretary of Labor v. Beverly Enterprises, 1996). A survey of nurses in a university hospital used a case–control design to examine back injury risk factors. The survey results reported that incidences of back injury were 3.3 times more likely to occur among nurses than other clinical groups working in the hospital. The average costs associated with back injuries were $1,715 for worker's compensation and 16.5 missed workdays. Back injury risk factors were determined to be obesity, lifting and twisting and prior back injury. Obese workers, workers with prior back injuries and workers lifting patients were 3.2, 18.3 and 4.8 times more likely, respectively, to experience a work–related back injury than their counterparts. The study identified several limitations that could affect survey results, which included but were not limited, to recall and response bias, and low response rate; however, these findings were consistent with those of other studies (Fuortes, Shi, Zhang, Zwerling, & Schootman, 1994; Scanlon, 2001; Wing et al., 2004). In another study, one of the key predictors of neck, shoulder, and back injury were a previous history of such injuries (Smedley et al., 2003).

2.8.1.4 Work–Life Balance

Balancing multiple roles between work and family can be difficult. When the roles are unbalanced, it can add additional stress to the home–based DCW. These role conflicts result from lack of time due to multiple demands related to both family and work. Employed mothers are at a higher risk of developing role conflicts because the

need of the family can greatly interfere with work demands. Since 85%–90% of the home–based DCWs are females and 21%–26% are single parents, the effect of such conflict on work performance and worker's wellbeing might be great. Several studies have identified life inference with work demands as a predictor for job turnover, dissatisfaction and stress (Mostert, 2009).

2.8.2 Training

Training provided to DCWs is not being utilized in the workplace. The reasons for the lack of implementation are inconsistent among the studies reviewed. Libert et al.'s (1991) survey found that approximately 68% of the total respondents (n = 53) had less than an hour of training on lifting methods and 60% had considered resigning due to the high physical demands required to complete their responsibilities. The survey results (n = 19) also showed that work–related injuries occurred due to awkwardness of handling devices and insufficient training in lifting methods (Libert, California State University, & Sciences, 1991). Another study of nursing aides' perceptions of training and safety showed that aides perceived receiving more appropriate assistance during their training when using lifting devices and handling patients than in the workplace (Kopiec, 2000). Furthermore, aides described encountering stress, increased patient load and more responsibilities due to staffing shortages and high turnover rates (Kopiec, 2000). A qualitative study of nursing care centers located in the Pacific Northwest region of the United States asked multiple open–ended questions addressing DCWs' job responsibilities and duties, perceptions of their job and its value and concerns regarding their own health and safety. Other organizational climate–specific potential hazards identified during the study were insufficient training and staffing, high workload, lack of

proper communication and teamwork for completing responsibilities and forgetfulness. The study concluded that there were three main shortfalls within the direct care workforce: training, communication, and teamwork (Sofie, 2000).

Furthermore, 400 surveys of a conveniently recruited sample of Canadian HHC nurses showed that 20% of respondents reported a low back injury and 14% of nurses reported other injury incidences within the span of a 12–month period. The study identified an association between management practices and low back pain injuries. The study specifically examined the association between accessibility of preventative resources and self–reported low back pain injuries. The researchers reported that: (a) lack of formal policies and procedures; (b) injury reporting training; (c) continuing education; and (d) orientation on compensation policies, safety services, life insurance and disability increased the risk of HHC self–reported low back injuries (Cheung, 2000).

The literature suggested that the lack of long–term career training, commitment and standardization has negatively affected care providers' attitudes, perceptions and knowledge of care vital for workers to provide quality care to the patients they serve. In addition to the lack of practice guidelines, supervision and staff support inadvertently place the patient at risk of experiencing a preventable injury due to DCWs' lack of training, knowledge or skills in identifying health issues and knowing with whom to connect to receive proper assistance. The Institute of Medicine (2008) report suggested that the lack of professional supervision in combination with home–based DCWs' unsatisfactory training may lead to DCW actions that may result in occupation–related illnesses or injuries (Institute of Medicine, 2008).

2.8.3 Work Environment

2.8.3.1 Organizational Culture

During the 1980's, managed–care implementation resulted in rapid healthcare organizational change. Changes in organizational structures, processes and outcomes resulted in policies that incentivized cost–saving efforts but also resulted in reports of both patient and employee dissatisfaction. Dissatisfaction among healthcare employees, specifically nurses, was caused by multiple factors that included but were not limited to increased patient load, work stress, and inability to effectively supervise support staff (Aiken & Fagin, 1997; Sochalski, Aiken, & Fagin, 1997). Furthermore, working conditions affect overall healthcare quality, such as work environment, staffing levels, work hours, and organizational culture (Conklin, MacFarland, Kinnie-Steeves, & Chenger, 1990). To develop a positive working environment, these people–related variables must be present, including autonomy, environmental control and supervisory relationships (Aiken & Patrician, 2000). Home–based DCWs' psychological development and interactions with the social environment in the workplace were risk factors for low back injuries (Kerr et al., 2001).

Several factors have been identified as reasons explaining why LTC facilities' policies differ from the organizational climate observed. These factors include but were not limited to lack of proper supervision, unstructured job descriptions, few opportunities for career advancement and workers' perception that their work was not valued by upper management (Wing et al., 2004). Diverse multilayered concepts of organizational culture and climate have been utilized by several researchers to understand management and professional practice environments within an organization (Burke, Lake, & Paine, 2008;

James et al., 2008; Litwin & Stringer, 1968; Michela & Burke, 2000). Specifically within the healthcare industry, examining organizational culture and climate is important because of their association with employee: (a) morale; (b) stress; (c) burnout rate; (d) turnover rate; and (e) injury rate (Clarke, Rockett, et al., 2002; Dunham-Taylor, 2000; Eastburg, Williamson, Gorsuch, & Ridley, 1994; Fielding & Weaver, 1994; Robyn RM Gershon, Karkashian, Vlahov, Grimes, & Spannhake, 1998; Robyn RM Gershon et al., 2000; R. R. Gershon et al., 1995; Kenneley & Madigan, 2009; Scott, Mannion, Davies, & Marshall, 2003; Spector & Jex, 1991). Researchers to understand organizational culture have discussed the concept of microclimate. Service delivery, safety, training, innovation and ethical care are some examples of microclimates that have been researched and can be applied to HHC organizations (Hughes, 2006; Mikkelsen & Grønhaug, 1999; Schneider, 1980; Schneider, Bowen, Ehrhart, & Holcome, 2000; Ulrich et al., 2007; Zohar, 1980; Zohar & Luria, 2003). In addition, Gershon and associates' (2000 and 2009) work supports the relationship between safety climate and home healthcare workers' compliance with safety practices provided in training and policy and the risk of occupational injury (Robyn RM Gershon et al., 2000; Robyn RM Gershon et al., 2009).

The environment of home health nurses differs from that of nurse aides in more mainstream hospitals in a number of ways. These include the fact that home healthcare nurses work alone, with less physician interaction and less reliance on their organization's resources. Nurses within home health spend more time on paperwork than their hospital counterparts. There are a number of workplace/environmental characteristics that have a direct effect on the quality of care patients receive within a home setting. These include a high degree of patient autonomy, limited oversight of

informal caregivers by professional clinicians and situational variables unique to each home (Anthony & Milone-Nuzzo, 2005; Ellenbecker, Samia, Cushman, & Alster, 2008; The National Association for Home Care and Hospice, 2008). Several studies were identified in the literature that specifically examined relationships between organizational climate and occupational–safety outcomes in the home healthcare sector. The occupational–safety outcomes selected by all five studies were percutaneous injuries, back injuries and MSDs.

2.8.3.2 Work Design

Trinkoff and associates (2007) described the effect of nursing position, workplace and specialty among registered nurses (RNs) on reported needlestick injuries and examined the relationship between RNs' reported needlestick injuries and working conditions using a three–wave longitudinal survey conducted in two states during a two–year time span (November 2002 to April 2004). Actively licensed RNs (n=2,634) participated in wave one and the follow–up rate was 85% for wave two and 86% for wave 3. Only 2,273 RNs worked during the 12–month period before wave one and were included in the analysis. Approximately 16% of nurses reported one or more needlestick injuries during the 12–month period before the study's wave one. Trinkoff and associates (2007) found a significant association between the risk of needlestick injury and the number of needles used and hours worked per day, weekends worked per month, night shifts worked and more than 12–hour shifts worked per week at least once a week while adjusting for physician job demands. The authors concluded that even with the use of protective equipment and the implementation of injury prevention programs, work design and the job's physical demands remained significant contributors to the occurrences of

injury and illness to direct care workers (Trinkoff, Le, Geiger-Brown, & Lipscomb, 2007). Therefore, the working conditions and environment of home health workers are factor contributing to the risk of needlestick and other types of injury (Jack K Leiss et al., 2009). In addition, staffing arrangement and work design have been shown to be associated with the risk

2.8.3.3 Time Pressures

Time is an important resource in patient care, and lack of time reduces the overall quality of care provided and its effectiveness. Time constraints increases home-based DCWs stress levels and has shown in the literature as a psychosocial hazard that increases the risk for occupational injury.

Nurses who indicated having sufficient time to complete a home visit were 50% more likely to use PPE than nurses that reported being under time constraints during a home visit (Jack K Leiss, Sitzman, & Kendra, 2011; Trinkoff et al., 2007). A survey of 361 Swedish HHAs showed that being in a bent, twisted position and lack of workload planning increased the risk of developing shoulder and neck pain. However, lack of workload planning was not associated with low back pain (Brulin et al., 1998). Another questionnaire of 3,651 Norwegian nursing aides examined predictors of low back work–related injuries requiring medical attention or missed workdays. The study observed lifting patients and heavy equipment, high work demands and overtime, a perceived lack of agency or supervisory support and a perceived lack of supportive culture. The researchers attempted to adjust for the impact of the health status of nursing aides through prospective design and exclusion criteria. The results after controlling for NA health status showed that low back pain was significantly associated with aides who lifted

patients and experienced high work demands and overtime. On the other hand, the study did not control for aides' prior low back injuries or physical and psychosocial factors. The researchers identified confounding between psychological strain and lifestyle factors as study limitations (Eriksen, 2003). The findings from this study show that biomechanical measures in combination with organizational, social, cultural, and psychological factors can affect the likelihood of DCWs experiencing work–related low back injuries (Eriksen, 2003).

Other studies have found that time pressure, overtime, and workload increased home–based DCWs' risk of percutaneous injury. The first study's objective was to identify risk factors of percutaneous exposures and injury–reporting behavior using a cross–sectional survey of a large convenience sample of 32 HHC agencies and 738 RNs. Agencies varied in size, geographic location and ownership status; however, all but two of the agencies were located in New York State. The survey was disseminated to participants via mail and in person; hence, a response rate was not reported. The respondents were a representative sample for the state because their demographic characteristics were similar to those of other nurses in HHC in New York. The only differences reported by the researchers were that the mean age of the respondent nurses was greater than the mean of New York nurses in HHC (50 years of age compared to 48 years of age). The study results revealed that in the three–year period before the study, 14.7% of HHC nurses reported percutaneous injuries, 11.9% reported being stuck by a needle, 3.4% reported being injured by a sharp object and less than 0.5% reported being injured due to human bites. The rate of percutaneous injuries was calculated to be 7.6 injuries per 100 employees per year. The researchers also identified that 45.8% of

percutaneous injuries identified in the study questionnaire were not formally reported to the agency. When examining the relationship between organizational climate and occupational safety, the researchers found a correlation between organizational and job characteristics and reporting percutaneous injuries. The characteristics identified were poor safety climate, overtime, barriers to travel, exposure to household stressors and violence, providing wound care, use of sharps, handling contaminated needles and lack of compliance with safety policies. Furthermore, the study showed that workload related to employee travel to the patient's home was significantly related to percutaneous injuries (Robyn RM Gershon et al., 2009).

The second study examined the risk factors of blood and body–fluid exposure among non–hospital–based RNs using a 152–item self–administered questionnaire. The study was conducted in New York and used the membership roster of the New York State Nurses Association and the New York State Public Employees Federation as the sampling frame. The questionnaire was mailed to members selected using a stratified sampling technique. A total of 2,627 surveys were mailed out and 44% of recipients (1,156 RNs) returned the survey. During the 12 months before the study, 13% of HHC RNs reported they had received percutaneous injuries. All of the percutaneous injuries reported were due to needlesticks and only 40% of these needlesticks were formally reported to the hiring agency. The study also reported a significant correlation between needlestick injuries and organization and employee risk factors that included: poor safety climate, lack of training on the use of safety devices or their unavailability when needed, improper handling of needles and other sharp objects, high patient workload, overtime, number of years employed in HHC and noncompliance with safety policies and

procedures. The study also explored employee workload measured via: a) high number of patients to care for; b) working more than 40 hours a week; c) reporting more than eight hours of overtime; and d) mandatory overtime policies and found a statistical relationship to percutaneous injuries (R. Gershon et al., 2007).

As stated earlier, MSDs are one of the most common types of injuries sustained by both facility– and home–based DCWs. Multiple studies have examined occupational factors associated with increased risk for MSD. These studies specifically examined the relationship between the physically demanding nature of the direct care workload and the other factors–environmental, psychological and organizational–that can greatly influence an individual's risk of experiencing a work–related injury. Common factors that have been identified consistently throughout these multiple studies were the physically and emotionally demanding job responsibilities of home–based DCWs and the heavy workload due to high turnover and care provider shortages (Ahlberg-Hulten, Theorell, & Sigala, 1995; Brulin et al., 1998; Johansson, 1995; Li, 2010; Sofie, 2000). The shortage of care providers extended beyond the home healthcare setting to all healthcare delivery systems, whereby it is estimated that the United States and incorporated territories will need an additional 3.5 million healthcare workers by 2030 to maintain the current worker–patient ratio, which is currently a low worker to higher patient ratio than that recommended of quality standards (Mather, 2007). In a study conducted by Kopiec (2000) of nursing aides' perceptions, aides described encountering stress, increased patient load and more responsibilities due to staffing shortages and high turnover rates (Kopiec, 2000). NAs' perceptions were examined by Libert's (1991) study of direct care study at give hospitals. The survey addressed five major topics. The first set of questions

was used to gather information regarding work–related injuries. The second set of questions addressed the factors that led to injury, the third set of questions explored the workers' job duties and responsibilities, the fourth set of questions asked employees about their training in safety and the last set of questions asked employees to share their safety behaviors and practices. The survey results (n = 19) showed that work–related injuries occurred due to multiple task–related factors including large workload and a high number of patients to care for (Libert et al., 1991).

2.8.3.4 Leadership Style

A couple of studies examined the relationship between management practices and MSDs using secondary survey data that were originally collected in 1996 from 892 conveniently sampled home healthcare DCWs in three not for profit HHC agencies in one Canadian city (Denton, Zeytinoglu, Webb, & Lian, 1999). The first study, published by Zeytinoglu and associates (2000), conducted two analyses. The first analysis was of 613 female home healthcare workers who reported a MSDs–related injury and the second was of the 413 who did not report experiencing a MSDs. Both of the analyses included negative safety measures such as hazards in the resident's home, work stress, and other injuries that occurred due to patient handling (Zeytinoglu, Denton, Webb, & Lian, 2000). The second was published by Denton and associated (2002) and conducted an analysis of all 674 male and female home healthcare workers with or without reported injuries. The study used agency and job predictors that were limited to hazards in the home, MSD injuries reported in a 12–month period prior to the study, stress, employee age and financial stability and perceived physical demand of job responsibilities (Denton, Zeytinoğlu, & Davies, 2002). Both studies provided consistent results that management

practices were not significant in helping predict self–reported MSDs. Zeytinoglu and associates' (2000) study identified that employees' workload measured by the demand for physical effort was a statistically significant predictor for MSD injuries in females with and without diagnosis (Zeytinoglu et al., 2000). Denton and associates' (2002) study also identified that employees' workload (measured similarly) was statistically significant in predicting MSDs in all home-based DCWs. However, when job stress was introduced to the model, workload was no longer significant (Denton et al., 2002).

2.8.4 Ergonomic Factors

Although ergonomic issues are relevant across different industries and occupations, several of these issues are exacerbated for DCWs because of the home setting. The home environment provides a challenge to paraprofessionals due to its continual variability and that it is not specifically designed for the delivery of care. For example, when the tasks of patient handling by lifting, pushing and pulling are performed by healthcare paraprofessional and professional, in the home environment the worker has less staff assistance and will require the need to use of ergonomically designed equipment that is often than not unavailable (Czuba, Sommerich, & Lavender, 2012; Traci Galinsky et al., 2013). Formal caregivers who provide services related to ADLs have been identified as having a high rate of MSD injuries (T. Galinsky, Waters, & Malit, 2001). Educating and training DCWs on the proper use of body mechanics has not shown strong evidence in the prevention of work–related injury; however, altering the physical demands through the use and continuous availability of assistive devices has shown strong evidence in the reduction of occupational injury, psychosocial hazards and patient injury (Owen, 2000).

Beltrami and associates (20000 examined 33,606 home visits and 19,164 procedures performed by direct care workers to examine the frequency and causes of blood–contact incidents within home direct care work. From this sample of work and procedures, they reported 53 blood–contact incidents, five from needlesticks and sharps injuries and 48 from direct skin contact. They estimated the percutaneous injury rate to be 0.6 per 1,000 procedures that involved the use and handling of sharps (Beltrami et al., 2000). Leiss (2011) explored the association between provision and utilization of personal protective equipment (PPE) and risk of exposure to blood–borne pathogens. The study results reported that approximately 77% of nurses were continuously provided with the appropriate type of PPE and were 2.3 to three times more likely to use it when required compared to nurses who were not always provided PPE or provided with an inappropriate type of PPE. The main reason for exposure to blood was the inappropriate use of protective equipment, specifically gloves, whereby gloves were not used in 48% of procedures that involved potential blood exposure (Jack K Leiss et al., 2011).

An earlier study examined the relationship between provisions of safety devices and risk of sharp injuries. The study estimated that 51 to 83% of nurses were always provided with safety devices by their employing agency to complete their job responsibilities. Second, the study examined the utilization pattern of safety devices and found that during the most recent procedure requiring the use of sharps, 95% of nurses who were continuously provided with safety devices used them, compared to the 15% of nurses who were not (J. K. Leiss, 2010). Multiple published studies have suggested that improper use or failure to use safety devices among home and hospice care RNs was primarily due to limited access, unavailability or lack of consistent availability of safety

devices and equipment. A study conducted in 2010, found than 50% of participants lacked the availability of lifting devices in a facility setting and approximately 74% indicated lifting and transferring patients manually (S. J. Lee, Faucett, Gillen, Krause, & Landry, 2010). These studies along with others have suggested that the availability of needed safety devices could lead to a reduction in the risk for work–related injuries among home–based DCWs (J. K. Leiss, 2010; Jack K Leiss et al., 2009; Jack K Leiss et al., 2011). Furthermore, home–based DCWs' patient handling practices and procedures are impacted by the availability of safety devices (Johnsson, Carlsson, & Lagerström, 2002; Marras, Davis, Kirking, & Bertsche, 1999; A. L. Nelson et al., 2007).

2.9 CONCEPTUAL FRAMEWORK

The following section describes the different theories and conceptual models explored in the current body of literature that identify occupational risk factors and examine the risk of occupational injury. Many of the models derive their fundamental conclusions based on the ability to assess the accident or event that caused the injury. The study is based on a self–reported survey that is limited and lacks the ability to examine the event of injury. Therefore, model integration is necessary to allow the development of the appropriate guiding theory and conceptual framework for the study. The factors explored in the operationalization of the conceptual framework are socioeconomic and demographic characteristics, training, perceived work environment and ergonomic factors.

Most injury models and theories adapted to examine occupational injuries are primarily based on a closed system theory and derive their ideas from Heinrich's domino model and Gibson's and Haddon's epidemiological models of energy barriers to illustrate

linear chains of an injury process. Heinrich's domino model, also known as the sequential accident model, states that there are five domino domains in the accident sequence, such that the fall of the first domain results in the sequential fall of all those that follow. The five factors are: (a) social environment; (b) human factors; (c) unsafe actions; (d) accident; and (e) injury. Gibson's and Haddon's epidemiological models of energy barriers regard events that lead to the occurrence of accidents as parallel to the combination of multiple manifesting and latent factors that interrelate. The domino model and epidemiological models are all unsuitable to examine and explain the multifaceted interactions between open system components within a complex socio-technical environment (Gibson, 1961; Haddon Jr, 1968; Heinrich, Petersen, & Roos, 1980).

Therefore, it is importance to use a system–based approach as the foundation for developing the study's guiding framework for identifying occupational injury risk factors within the home healthcare setting. System theory provides a holistic view of an organization, which allows accident modeling to consider the effects of human, technical, and environmental factors. This approach to accident and injury modeling takes into consideration the performance of a system as a whole (Erik Hollnagel, 2004). The system theory states that a system's processes are dynamic in nature and are continuously adapting to its changing environment to achieve its set goals and objectives. It outlines the principles, models and laws necessary to interpret complex interrelationships and interdependencies between human, technical organizational and management factors to reach equilibrium through feedback loops of information and control (E. Hollnagel & Woods, 1999). Expanding on this overall definition of system theory is that system design should influence behavior to promote safe work operations while adapting to non–

static changes. Therefore, accidents and injuries are the results of flaws in system processes that are due to interactions between human factors, social and organizational structures, physical and software components and system–level activities (Leveson, 2004). However, the use of technology such as computers and software are not explored in the study.

One way to explore system theory is via work organization or work process. NIOSH and the National Occupational Research Agenda (NORA) developed the NIOSH Work Organization Framework. NORA is an evaluation framework and partnership program used by NIOSH to conduct occupational safety research. NORA consists of eight sector–specific program agendas focusing on translating evidence–based research into practice. One of the eight sectors is the Healthcare and Social Assistance (HCSA) program. HCSA covers approximately 16.6 million workers and has identified its recipients as having high proportions of occupation–related injuries compared to other NORA sectors (Department of Health and Human Services, and National Institute for Occupational Safe, 2010; Sauter et al., 2002). The concept of work organization (Figure 2.9) as described by NIOSH/NORA states that the multi–dimensional construct of work organization influences the risk of exposure to occupational illnesses and injury and hence, the occurrence of workplace–related injuries via the availability of occupational health services and activities (for example, injury–prevention policies, training and workplace environment) and by influencing exposure to psychosocial and physical hazards (McPhaul & Lipscomb, 2004; Sauter et al., 2002; Theorell, Karasek, & Eneroth, 1990). After thorough examination of the literature, it is clear that the topic of work organization is insufficiently researched in the field of occupational safety and health.

The literature suggests that the term “work organization” lacks a consistent definition across the literature using a multidimensional construct and thus does not provide the appropriate framework for this study (Sauter et al., 2002).

Another approach to system–based accident modeling is exploring the pathways between causes and effects of accident characteristics and explaining the main reasons for why they occur in collaboration with technology. Modern technology has created a need to update accident models to incorporate the effects of technology on the characteristics of accidents and risk assessment (Leveson, 2004). Large, complex micro systems such as the healthcare system are semantically complex because of the amount of time required to comprehend and master relevant competencies and domains of knowledge. The healthcare system is comprised of tightly coupled interactions between multiple parts–both human and machine–to execute procedures more often than not completed under time constraints or other resource constraints (Donabedian, 1988). Therefore, accidents develop as a result of a series of small failures and near misses, both machine and human, that has accumulated over a period of time (Reason, 1995). Hence, using a system approach to assess the risk of an accident will account for interactions among system components (Leplat, 1984).

The last approach to accident modeling is examining the human aspect of accident causation and is the guiding framework for the study. It was selected because of its use of system approach, its incorporation of human, technology and environment and it is the only presented model that does not require the ability to assess the actual injury event. Between the early 1940’s and mid–1980’s, many industries made major efforts to limit the human contribution to accidents in highly hazardous occupational fields such as

airlines, road transportation, nuclear power generation, and chemical processing plants. Accidents in these highly hazardous occupations result in catastrophic environmental damage that affects the lives of many, including employees. However, accidents occurring in the healthcare field mostly affect two individuals–the employee and the patient–in a wide variety of healthcare settings with little to no publicity about incidents (Brennan et al., 1991; Craib et al., 2007; Leape et al., 1991). The study of human factors is defined as the application of information "about human strengths and limitations to the design of interactive systems of people, equipment and their environment to ensure their effectiveness, safety and ease of use" (Henriksen, Dayton, Keyes, Carayon, & Hughes, 2008). The International Ergonomics Association further defined human factors as "the scientific discipline concerned with the understanding of interactions among humans and other elements of a system and the profession that applies theory, principles, data and other methods to design in order to optimize human well–being and overall system performance" (International Ergonomics Association, 2010).

Therefore, this definition means that tasks executed by home–based DCWs, the devices they use, the work environments they function in and the organizational policies they obey interact differently with their strengths and limitations. Figure 2.10 illustrates how human factors focus on the application of what is known about human behavior, abilities, perceptions and limitations to the system, workplace environment, tasks and equipment/technology and training (Butz, 2013). When these system–level factors are inappropriately matched with human factors, poor outcomes frequently occur, resulting in worker injuries and accidents (Reason, 1995). Investigation of the human and organizational factors affecting the risk of exposure to injury and the occurrence of

accidents has emerged as an interdisciplinary research field. The goal of exploring human factors is to enhance both human and system efficiency, effectiveness, safety, health and quality of life for both workers and patients (Butz, 2013). Researchers have mainly explored the immediate human–system interface and activities carried out within a complex organizational structure. Therefore, understanding failures caused by the interaction of the system and humans is important, especially within the healthcare industry, where humans rather than machines deliver care and failures result in accidents (K. Henriksen et al., 2008; Reason, 1995). Figure 2.10 shows a model of the human factors in home healthcare using a system theory approach. The system consists of the person(s) involved in the delivery of home healthcare, the manner in which home healthcare tasks are delivered, the equipment /technology used by home–based DCWs and the political, community social and physical environments in which these interactions take place.

The conceptual framework adopted to address the study research questions is depicted in Figure 2.11. The model illustrates how work–injury is affected by people having different characteristics, the type of technology and devices utilized and the nature of the tasks being accomplished using a one–direction arrow. As a result, the risks for occupational injury vary with respect to these three categories of factors. In the model the bi–directional arrows depict the interactions between persons' characteristics, technology, and tasks. Furthermore, training affects the magnitude of how devices and tasks influence the risk for occupational injury. The community, social and physical environments in which all of these factors are housed interact with each other and are illustrated by the overlapping circles.

Table 2.1 Persons Served and Visits for Medicare Home Health Agency Services, By Demographic Characteristics, 2012

	Persons served		Visits		
	Number in thousands	Per 1,000 enrollees	Number in thousands	Per person served	Per 1,000 enrollees
Total	3,460	93	117,669	34	3,162
Age					
Under 65 years	476	69	16,918	36	2,461
65–74 years	835	50	25,203	30	1,499
75–84 years	1,113	122	37,937	34	4,165
85 years or over	1,036	234	37,611	36	8,506
Sex					
Male	1,293	76	41,925	32	2,457
Female	2,166	107	75,744	35	3,758
Type of entitlement					
Aged	2,984	98	100,751	34	3,321
Disabled	476	69	16,918	36	2,461
Race					
White	2,755	90	88,694	32	2,894
Other	704	107	28,975	41	4,414

Source: Centers for Medicare & Medicaid Services, Office of Information Services: Data from the Standard Analytical Files; data development by the Office of Information Products & Data Analytics (R. I. Stone & Barbarotta, 2010).

Table 2.2 Employment Projections of Paraprofessional Direct Care Workers in Home and Hospice Care Settings, 2012–2020 (Number in Thousands)

	Employment 2012		Employment projected 2022		Employment change 2012–2022	
	Number	%	Number	%	Number	%
Total	686.5	78	1,147.10	78	460.6	67
HHA	323	26.9	537.3	28.1	214.3	66.3
PCA	298.6	24.9	496.7	25.9	198.1	66.3
CNA	64.6	5.4	112.6	5.9	48	74.3
Orderlies	0.3	0	0.5	0	0.2	66.6

Notes: Percentages are of the industry. HHA= Home Health Aide, PCA= Personal Care Aide, and CNA= Certified Nursing Assistant.
Source: Bureau of Labor Statistics, National Employment Matrix, 2012–2020 (United States Bureau of Labor Statistics, 2012e).

Table 2.3 Employment Wages of DCWs in Home Healthcare Industry, 2012

	Employment[1] in thousands	Hourly mean wage	Annual mean wage[2]	Hourly median wage	Annual median wage[2]
Total	674.7	$11.55	$24,010	$10.97	$22,810
HHAs	317.4	$10.46	$21,750	$9.82	$20,420
Nursing assistants	63.4	$11.35	$23,600	$10.90	$22,680
Orderlies	0.3	$15.20	$31,610	$14.24	$29,620
PCAs	293.5	$9.17	$19,080	$8.90	$18,520

Notes: Estimates for detailed occupations do not sum to the totals because the totals include occupations not shown separately. Estimates do not include self–employed workers. Annual wages have been calculated by multiplying the hourly mean wage by 2080 hours; where an hourly mean wage is not published, the annual wage has been directly calculated from the reported survey data.
Source: Bureau of Labor Statistics, National Employment Matrix, 2012–2020. Data extracted on January 24 2014 (United States Bureau of Labor Statistics, 2012e).

Table 2.4 Nonfatal Occupational Injury and Illness Rate Per 10,000 Full Time Workers for Healthcare DCWs: Selected Characteristics, 2011 Forward

	All industries	LPN/LVN	RN	HHA	PCA	NA	Orderlies
Total rate per 10,000 full time workers	112.4	145.1	129.7	131.5	185.8	425.8	371.2
Musculoskeletal disorders	37.8	50.9	58.4	53.3	74.9	225.8	222.1
Event or exposure:							
Violence	7.2	23.2	16.7	17.7	40.1	62.2	10.7
Falls, slips, trips	27.8	43.3	34.4	34.3	35.4	78	59
Exposure substances	5	8.8	3.8	3.4	3.4	7.7	21.2
Contact with object, equipment	25.5	12.5	11.7	7.9	15.9	38.1	43.1
Overexertion lifting/lowering	12.4	10.2	14	9	21.4	53.6	57.5
Nature of injury illness:							
Fractures	8.2	5.7	7.4	7.7	9.2	10.6	14.5
Sprains, strains, tears	43.2	64.2	70.8	60.5	94.4	238.9	243.6
Bruise, contusions	9.5	13	13	7.2	14.6	36.7	31.3
Source of injury illness:							
Chemical, chemical products	1.3	7.1	1.5	0.3	0.8	3.2	20.6
Machinery	14.8	1.7	3.5	1.5	3	5.5	10.1
Person, other than injured	11.1	53.8	57.1	57.3	94.9	251.5	139.5

NOTE: Because of rounding and data exclusion of no classifiable responses data may not sum to the totals. Nonfatal cases involving days away from work. LPN/LVN = Licensed Practical and Licensed Vocational Nurses, RN = Registered Nurse, HHA = Home Health Aide, PCA = Personal Care Aide, NA = Nursing Assistant. Categories are in accordance with the Occupational Injury and Illness Classification System 2.01.

Source: Bureau of Labor Statistics, The Injuries, Illnesses, and Fatalities (IFF) Program 2011–2012. Data extracted on January 24 2014 (United States Bureau of Labor Statistics, 2012b).

Table 2.5 Hazardous Conditions in Patient Homes Reported By Home–Based DCWs, 2007–2008

	Robyn RM Gershon et al. (2008)	Kerm Henriksen et al. (2008)	Markkanen et al. (2007)
Biological Hazards			
Vermin (i.e. cockroaches, mice/rats)	✓	✓	
Unsanitary conditions (i.e. dirty toilets)	✓	✓	
Lack of workstations			✓
Encountering sharps when housekeeping			✓
Chemical Hazards			
Irritating chemicals (i.e. bleach)	✓	✓	✓
Ergonomic and physical hazards			
Poor living environment (i.e. animal hair)	✓	✓	✓
Slips/trips/falls hazards (i.e. messy home)	✓	✓	✓
Heavy lifting			✓
Patient moving			✓
Psychosocial hazards	✓	✓	
Verbal abuse	✓	✓	
Neighborhood violence/crime	✓	✓	✓
Racial or ethnic discrimination	✓	✓	
Threat of physical harm	✓	✓	
Drug use in the home	✓	✓	✓
Client's neighbors	✓	✓	✓
Guns in home	✓	✓	✓
Threatening family members	✓	✓	✓
Working alone			✓

Source: (Robyn RM Gershon et al., 2008; Kerm Henriksen et al., 2008; Markkanen et al., 2007)

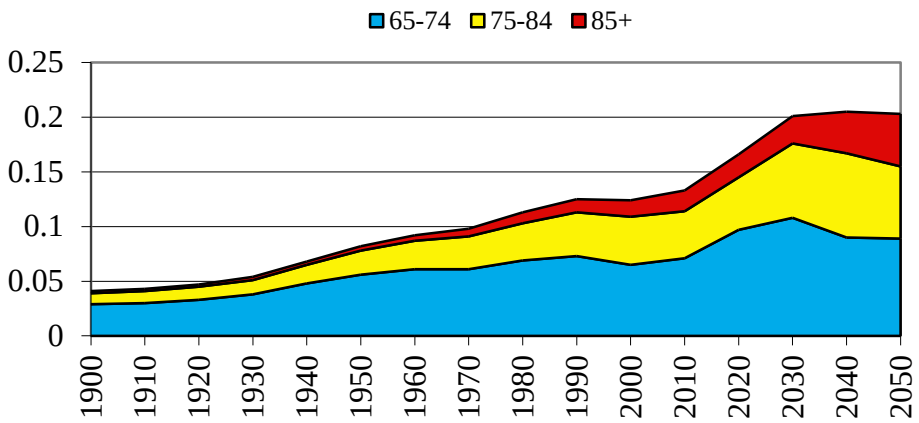

Figure 2.1 Percent of total population, age 65 and older, 1900 to 2050

Source: U.S. Bureau of the Census was retrieved from (S L Mcginnis & Moore, 2006)

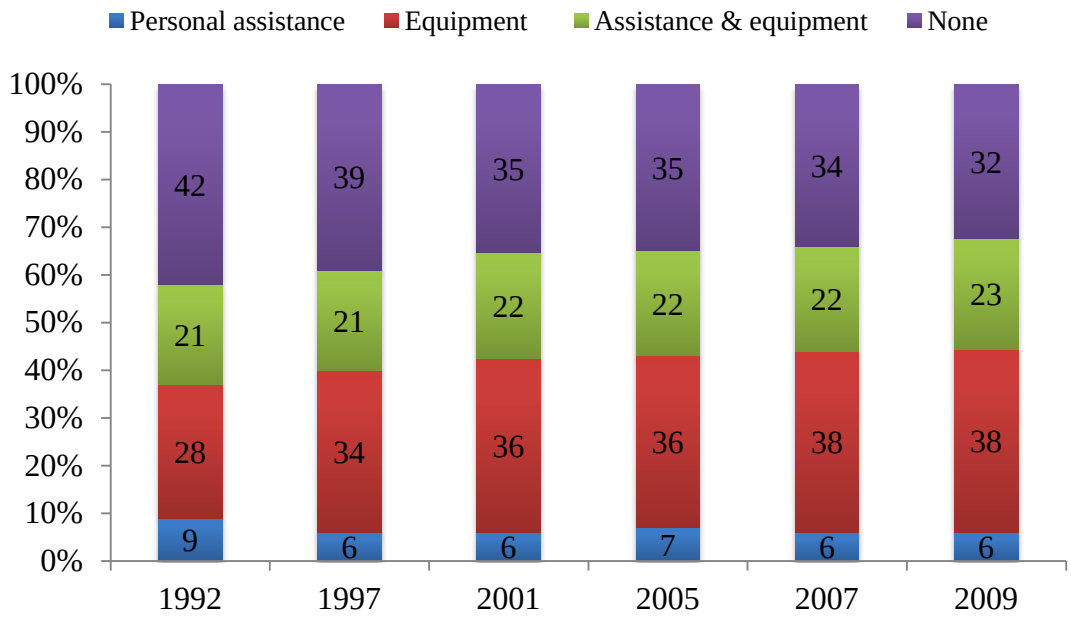

Figure 2.2 Percent distribution of home healthcare Medicare enrollees age 65 and over who have limitations in ADLs, by types of assistance, selected years 1992–2009*

*Respondents who reported with an activity are subsequently asked about receiving help or supervision from home health aid with the activity and about using special equipment or aide. Percentages are age–adjusted using the 2000 standard population.
Source: Centers for Medicare and Medicaid Services, Medicare Current Beneficiary survey (National Center for Health Statistics, 1992-2009).

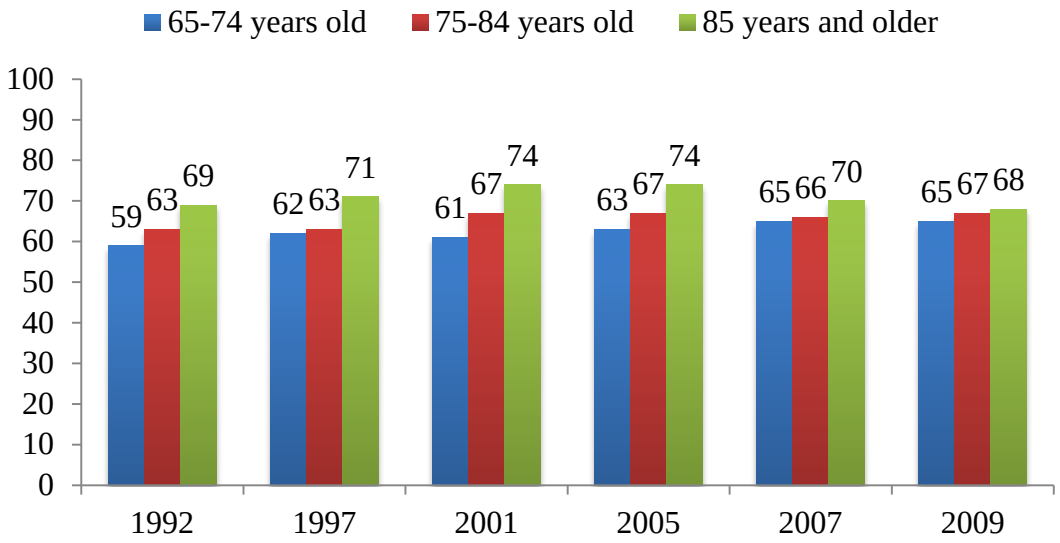

Figure 2.3 Percentage of home healthcare Medicare enrollees age 65 and over who have limitations in IADLs and who receive personal assistance, by age group, selected years 1992–2009*

*Respondents who report difficulty with an activity are subsequently asked about receiving help from home health aide with the activity.
Source: Centers for Medicare and Medicaid Services, Medicare Current Beneficiary survey (National Center for Health Statistics, 1992-2009).

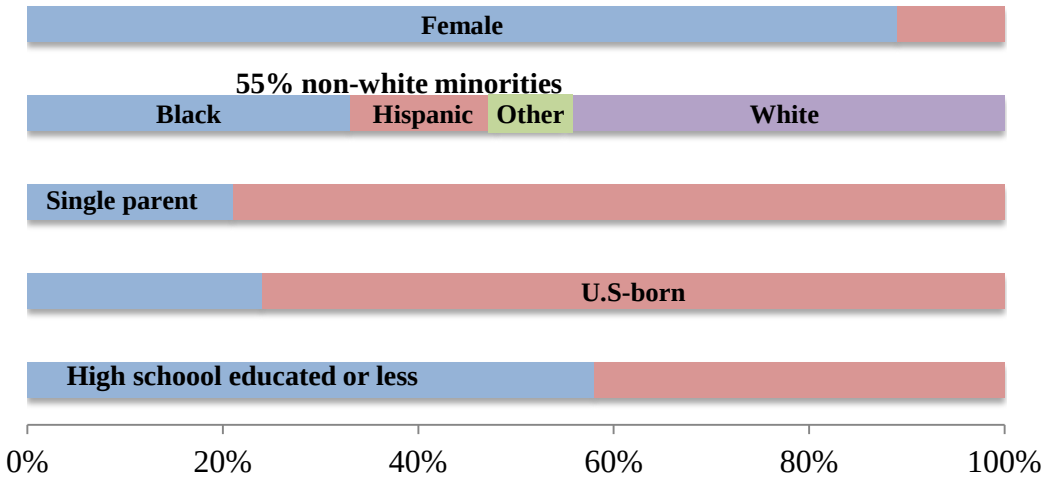

Figure 2.4 Description of home–based DCWs characteristics in 2012 (n=674,700)

Source: (United States Bureau of Labor Statistics, 2012a)

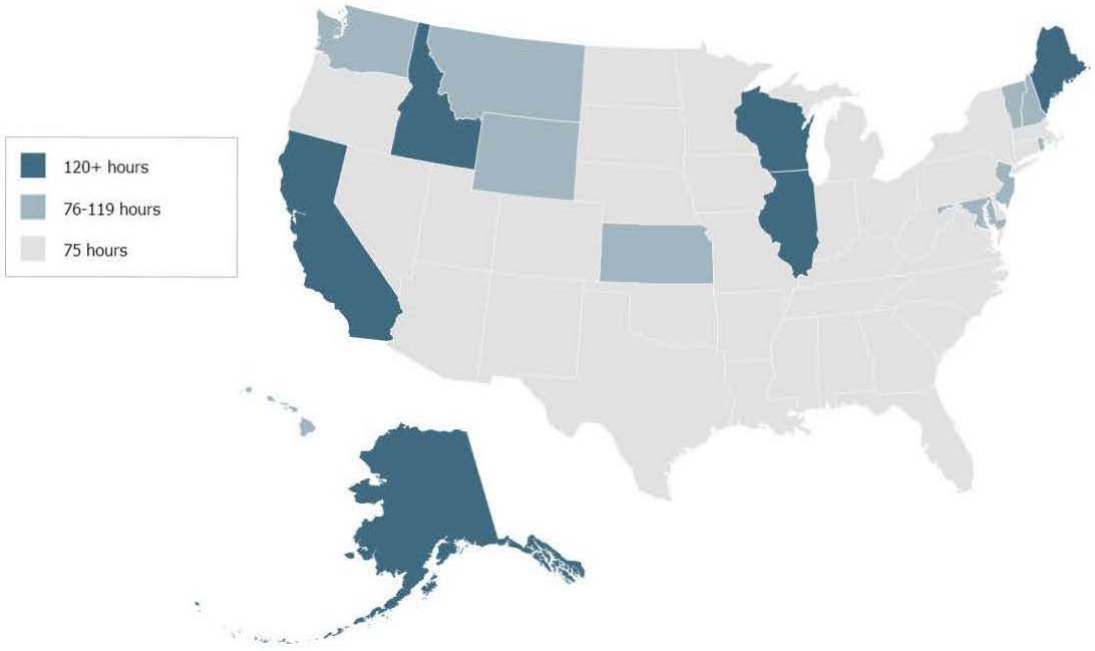

Figure 2.5 HHAs training requirements, 2013

Source: (Paraprofessional Healthcare Institute PolicyWorks, 2013)

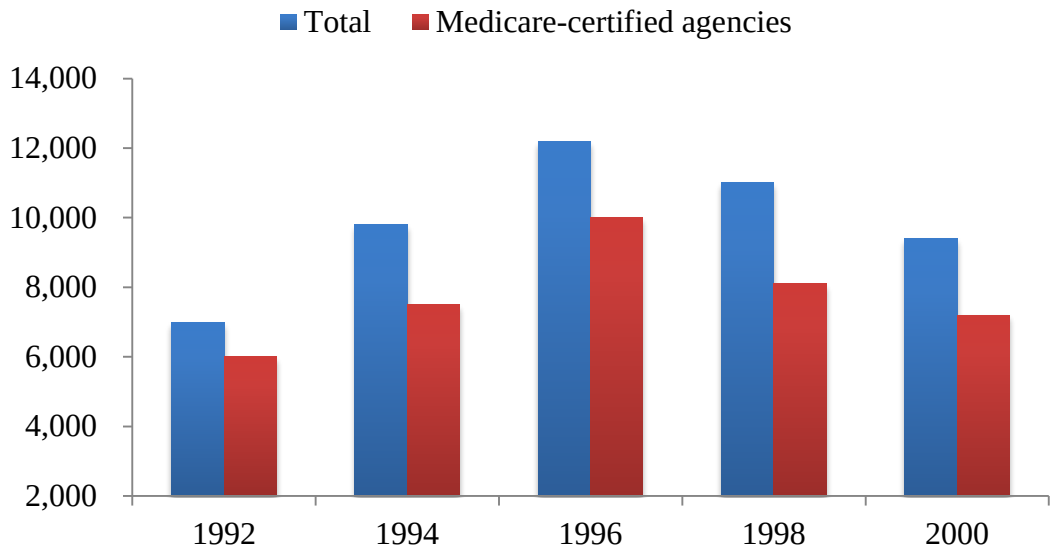

Figure 2.6 Home healthcare agencies and Medicare–certified home healthcare agencies: United States 1992–2000

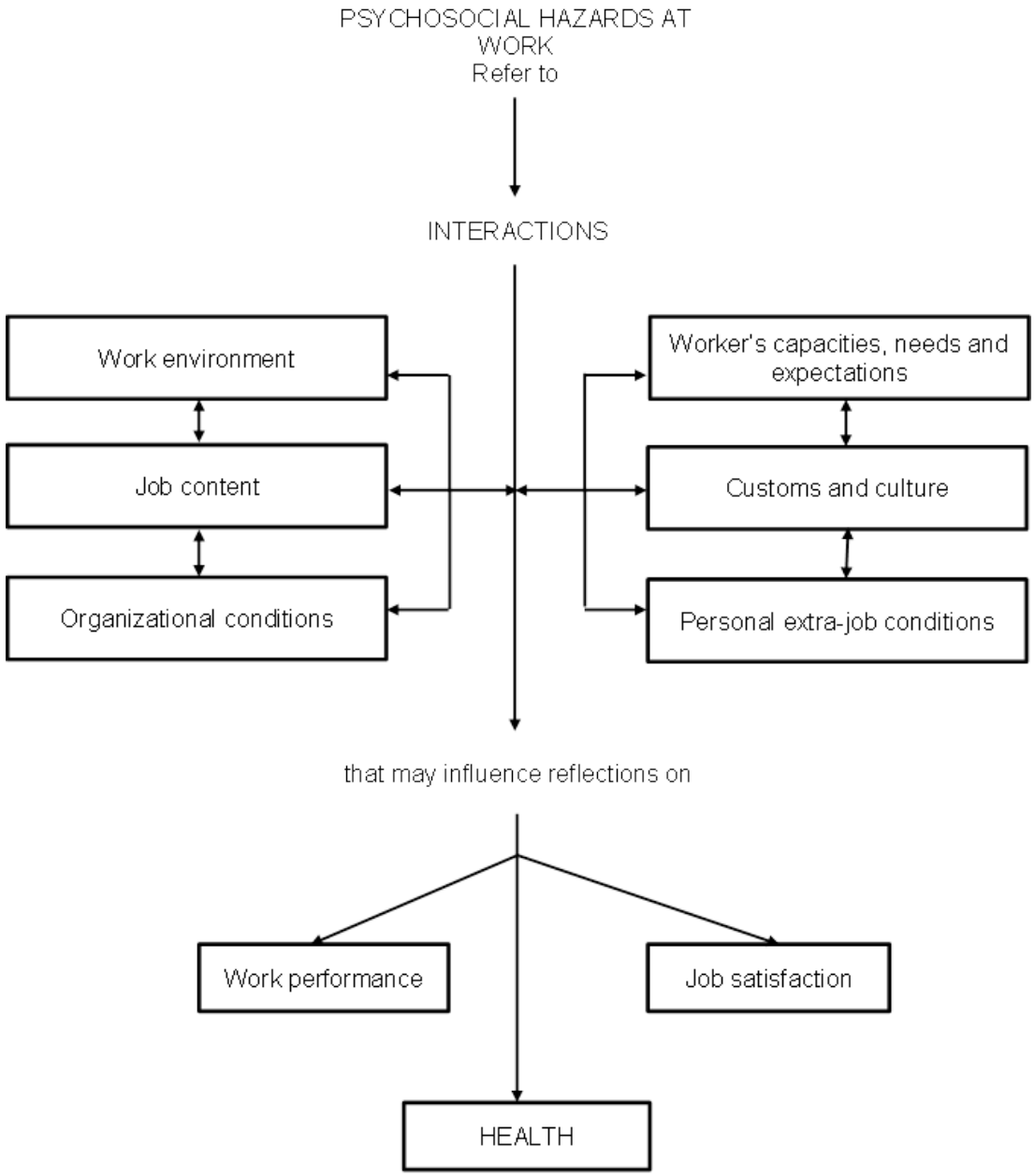

Figure 2.7 Psychosocial hazards at work

Source:(Joint ILO/WHO Committee on Occupational Health, 1984)

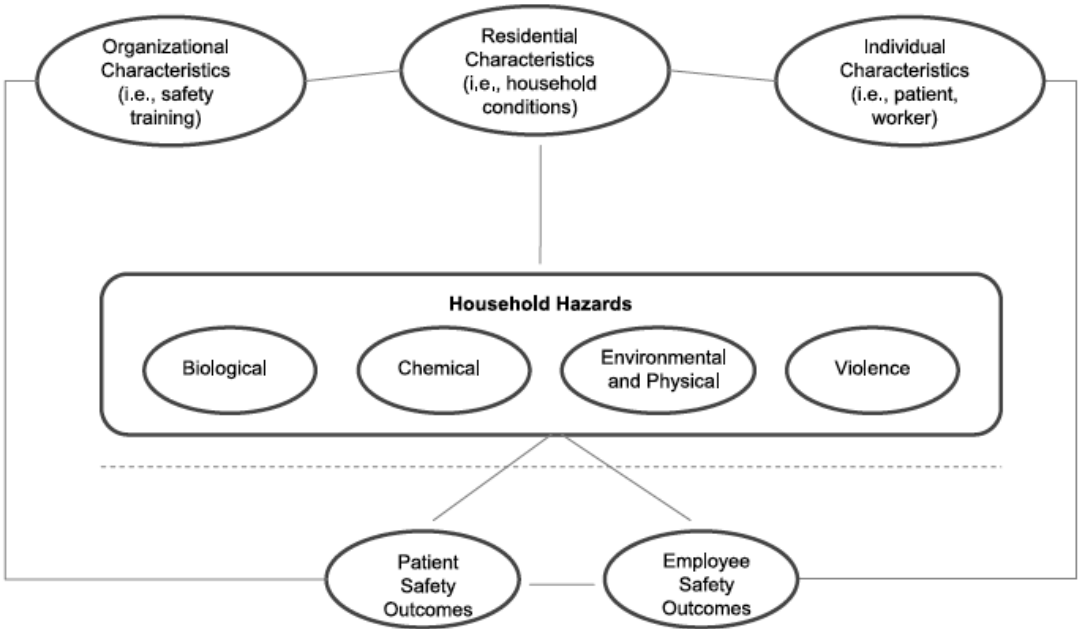

Figure 2.8 Home and safety in the home healthcare industry

Source: (Robyn RM Gershon et al., 2008)

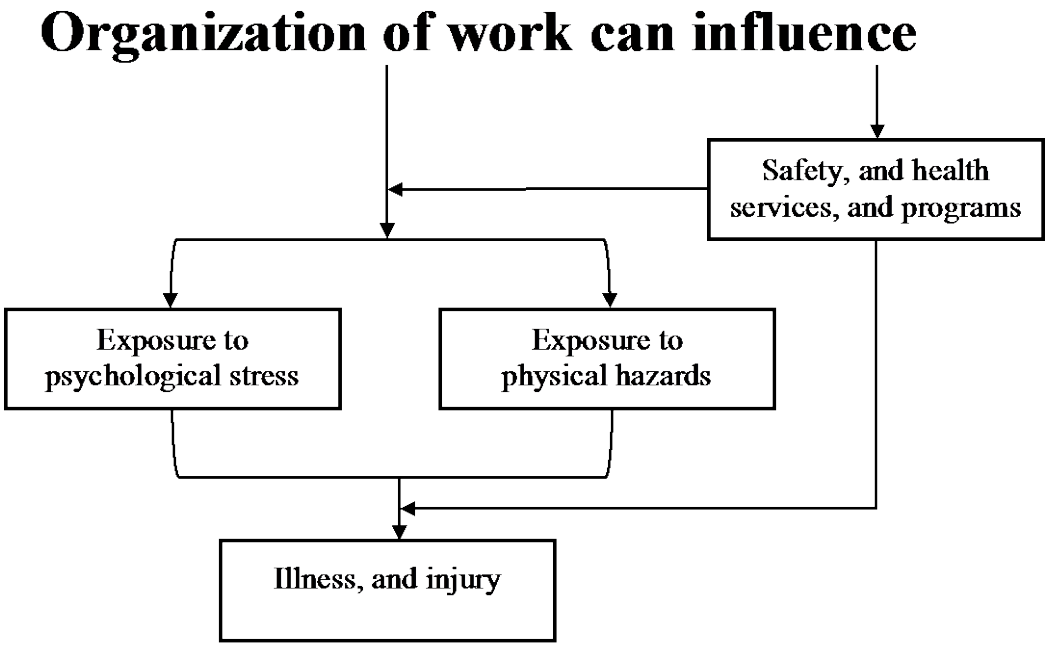

Figure 2.9 Pathway between organization of work and illness and injury

Source: (Sauter et al., 2002)

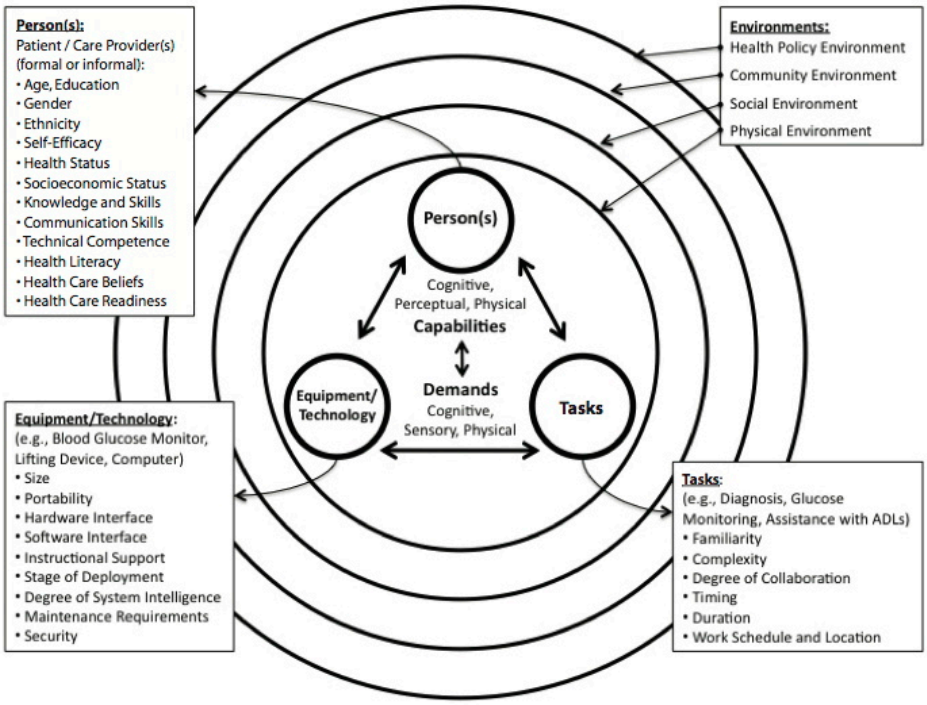

Figure 2.10 Model of human factors of healthcare in the home.

Source: (Czaja et al., 2006)

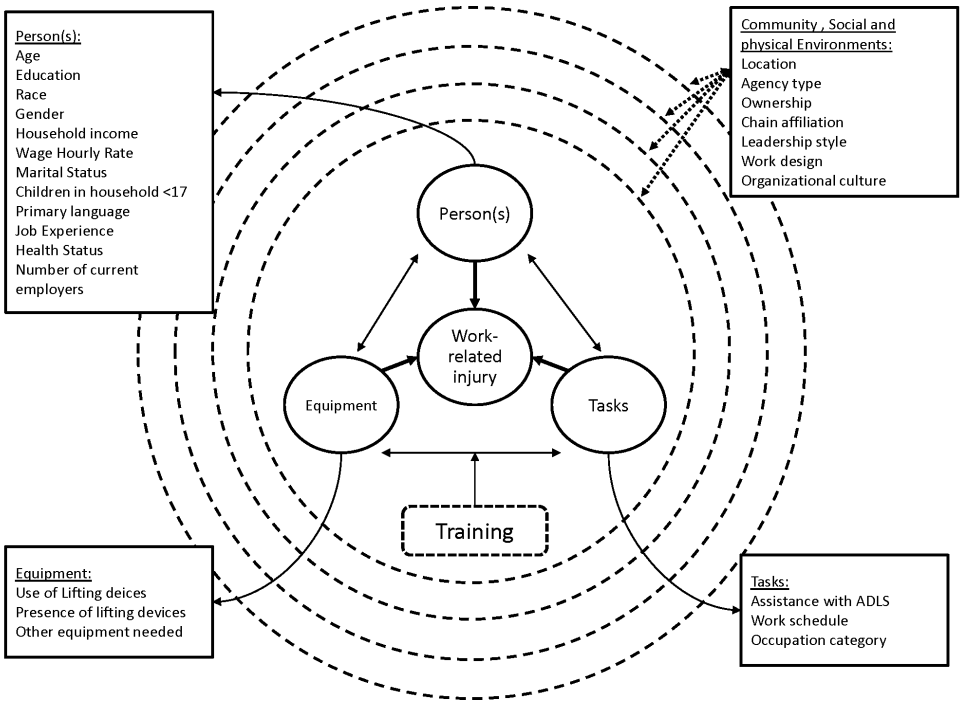

Figure 2.11 Model of human factors of healthcare in the home using study specific variables

Source: Adapted from (Czaja et al., 2006)

CHAPTER 3

METHODOLOGY

Prior occupational injury and accident causation studies have primarily profiled industrial workers and examined their risk of injury. Healthcare worker specific occupational injury research has continuously focused on nurses and direct care workers (DCWs) who deliver care in institutional settings. The dissertation research builds on those prior studies by specifically profiling occupational injury patterns in home–based DCWs who deliver care primarily at patient homes and the association of individual, environmental and ergonomic factors with the risk of injury. The purpose of this research is to: (a) describe the patterns of occupational injury across home–based DCWs' personal characteristics and place of care delivery; and (b) examine the relationship between the risk of injury and worker training, perceived environment and ergonomic factors.

3.1 RESEARCH QUESTIONS

The methodology used in the study is outlined here in Chapter 3. The chapter begins with an overview of the research objectives, questions, and hypotheses. Next, a description of the data is given, followed by an outline of the study design and selected dependent, independent, and covariate variables. Finally there is a summary of the analyses executed to achieve the objectives of the study.

The objectives of the study were twofold. The first was to establish a baseline by profiling and describing occupational injury patterns across home–based DCWs' personal characteristics and places of care delivery. The second was to examine how worker training, perceived environment and ergonomic factors affect home–based DCWs' risk for occupational injury. The study used data from the 2007 National Home Health Aides Survey (NHHAS) to investigate four research questions, which are:

1) What different types of occupational injuries and severities that are reported by home–based DCWs?

    a) How do injury patterns vary by personal characteristics (e.g., race, education, hold multiple jobs, etc.)?

    b) How do injury patterns vary by the place of care delivery (e.g., patient homes only, one or more inpatient facilities only or both)?

2) What is the relationship between home–based DCW training and (a) the probability of reporting one or more work–related injuries and (b) the degree of injury severity?

3) What is the relationship between workplace environment (measured by workers' perceptions of leadership style, work design and organizational culture) and the probability of reporting one or more work–related injuries?

4) What is the relationship between ergonomic workplace factors and the probability of reporting one or more work–related injuries?

3.2 STUDY POPULATION

In 2007, the first National Home Health Aides Survey (NHHAS) was conducted to link worker and agency information. The study population consisted of home–based DCWs who were working in eligible home and hospice care facilities. The sampling frame for the eligible agencies was from the 2007 National Home and Hospice Care Survey (NHHCS). The 2007 NHHCS was part of a series of nationally representative surveys started in 1992 by the Centers for Disease Control and Prevention's (CDC) National Center for Health Statistics (NCHS). The survey was designed to provide

descriptive information on home and hospice care agencies, their staffs and their patients. Prior to 2007, the survey contained only three modules: (a) an agency module (AQ); (b) a patient health module (PH); and (c) a patient charges and payments module (PA).

Data collection for the 2007 NHHCS began in August of 2007 and was completed by February 2008. All data were collected through interviews with agency directors or designated staff for all three–survey modules, and thus, there was no direct contact or interaction with patients and their families. All participating agencies were Medicare and/or Medicaid certified or licensed by a state to provide home and hospice care services. Excluded from the survey were agencies that provided only homemaker services, assistance with instrumental activities of daily living (IADLs) and durable medical equipment and supplies' distributors. The total sampling frame was 1,036 home and hospice care agencies and 9,416 current patients (Bercovitz et al., 2010; Dwyer, Harris-Kojetin, Branden, & Shimizu, 2010).

The survey design was a cross–sectional, stratified two–stage probability sample. The first stage conducted by the NHHCS identified HHC agencies from over 15,000 agencies in the United States. The agencies were primarily stratified by their metropolitan statistical area (MSA) status and sorted by census region, type of ownership (for profit, private not for profit, city/county/state government, Department of Veteran Affairs, other federal agency and other), certification status (Medicaid, Medicare, other, none), state, county, ZIP code and number of employees. Through the implementation of systematic and random sampling with probability proportional to size, 1,545 agencies were selected and 1,036 agencies participated in the survey (Bercovitz et al., 2010).

Trained interviewers conducted the second stage of the probability sampling during the agency interviews. A computer algorithm used census lists provided by each selected agency to identify current home health patients (patients who were listed on the agency's rolls at midnight of the day before the scheduled interview), hospice discharge patients (patients who had been discharged from the hospice agency during the 3–month period beginning four months before the day of the agency interview–discharges that were due to mortality were included) and home health and hospice aides (HHAs). The algorithm randomly selected up to ten current home health patients from home health agencies, up to ten hospice discharges from hospice agencies and up to ten current home health patients and hospice discharges from mixed agencies (Bercovitz et al., 2010).

The sampling frame to identify HHAs was an employee directory, which was provided to interviewers during the in–person agency interviews by the agency respondents and then entered into the Computer–Assisted Personal Interviewing system (CAPI) system. The CAPI program randomly selected six HHAs who were employed at the same agency and delivered care services for activities of daily living (ADL). ADLs include eating, bathing, dressing, toileting, and transferring. A total of 4,416 eligible aides were selected, and 3,377 completed the telephone interviews, a response rate of 72% (Bercovitz et al., 2011). The main objective of the 2007 NHHAS was to gather nationally representative baseline descriptive estimates of the HHAs targeting topic areas such as training, job environment and limitation, motivation, supervisor and management. A secondary objective was gather data that can be compared to the 2004 National Nursing Assistant Survey (NNAS) in an effort to gain a representative description of direct care workers in long–term care (LTC).

3.2.1 Computer–Assisted Personal Interviewing (CAPI)

The 2007 NHHAS used CAPI to randomly identify and interview six HHAs across 1,036 home health, hospice, and mixed agencies. The implementation of the CAPI system through telephone interviewing is beneficial since it replaces traditional paper–and–pencil surveys administered either in person or by telephone. The software enables interviewers to effectively administer the survey to respondents and maintain interviewer integrity (Groves, Miller, & Cannell, 1987). CAPI allows interviewers to conduct telephone surveys while reading and entering information directly on a computer terminal. The software guides the interviewers by displaying survey instrument questionnaires and prompts (Niemann, 2003; Tourangeau, 2004). As an application, CAPI has proven to be useful to public health researchers in the aspect of complex survey item design and skips and loops patterns, reducing the likelihood of interviewer error (Niemann, 2003). As with all software systems, there are limitations to the CAPI system. CAPI restricts data entry of non–predetermined responses, which may potentially lead to the loss of data (Kempf & Remington, 2007; Niemann, 2003).

3.3 STUDY DESIGN

The study used a cross–sectional design to analyze nationally representative sample of worker–level data from the 2007 National Home Health Aides Survey (NHHAS). The study's primary dependent variable was *work–related injury*. The study also operationalized multiple independent variables and covariates; all of the covariates are listed in Table 3.1. Exact survey item wording is outlined in Table 3.3 (Centers for Disease Control, 2007).

As stated earlier, the first objective of the study was to establish a baseline by profiling and describing occupational injury patterns across home–based DCWs' personal characteristics and places of care delivery. This objective was directly linked to the first research question, which was:

1) What different types of occupational injuries and severities that are reported by home–based DCWs?

    a) How do injury patterns vary by personal characteristics (e.g., race, education, hold multiple jobs, etc.)?

    b) How do injury patterns vary by the place of care delivery (e.g., patient homes only, one or more inpatient facilities only or both)?

There are three primary variables for determining a baseline view of the study population of home–based DCWs. The first variable was types of occupational injuries, measured by home–based DCWs reporting the nature of the bodily injuries experienced and that had been reported to the agency that required medical attention or that caused missed workdays. One survey item asked all respondents who were still employed at the agency at the time of the survey if they have had a back injury including pulled muscles, other strains or pulled muscles, human or animal bites, scratches, bruises, burns or any other injuries. The yes responses were coded as one and No responses were coded as two, negative responses were then recoded as zero. If respondents answered negatively, no further questions related to injury were asked. If respondents answered positively to one or more types of injuries, then several questions were asked to further explore the frequency and perceived root cause(s) of these injuries.

The second variable was work–related injury, which reflects whether respondent reported an injury and the number of times they were injured. Work-related injury was measured by one survey item that asked respondents to indicate the number of injuries

that they reported to their agency during the 12–month period prior to the survey interview date. The survey question was only asked of individuals that stated they have experienced a type injury in the past 12-months. The public file dataset presented the values in six categories: one injury, two injuries, three or more injuries, inapplicable, refused and do not know. Inapplicable represents all respondents who did not sustain an injury during the 12-month period prior to the survey interview date since the question was only asked of individuals who indicated being injured. Work–related injury was operationalized in that inapplicable equates to not being injured (zero incidents of injury) and reporting one or more incidents of injury equates to being injured (McCaughey et al., 2012).

The third variable was injury severity, measured by home–based DCW's self–reported days of work missed because of injuries. One survey item asked all respondents who were still employed at the agency at the time of the survey and positively responded to the types of injury question to count the total number of missed workdays because of the injury experienced. The distribution of the responses was analyzed across HHAs, job and agency characteristics to determine the appropriate cut point for injury severity. The variable was operationalized into low injury severity for injuries that resulted in zero missed days of work and high severity for injuries that corresponded to one or more missed days of work.

Beyond the three primary variables, other worker's self–reported socioeconomic and demographic variables were utilized as covariates in the profiling of occupational injury patterns. Each of the categorical variables' cut points were determined by examining the total sample and work–related injury severity distribution across all levels.

These covariates are categorized into home–based DCW and agency characteristics. Home–based DCW characteristics include race, education, age, gender, household income, marital status, number of children in household ≤ the age of 17, primary language, place of care delivery, training, hourly pay rate, job experience, health status, employment status, hours worked per week, time at current job, number of jobs in the last 5 years and number of current employers. Agency characteristics include agency location, type ownership status and chain affiliation. Table 3.1 lists the covariate, their value, and mechanism of operation that consistent with the literature.

The second objective of the study was to examine how worker training, perceived environment and ergonomic factors affect home–based DCWs risk for occupational injury. This objective was directly linked to the following research questions and hypotheses:

2) What is the relationship between home–based DCW training and (a) the probability of reporting one or more work–related injuries and (b) the degree of injury severity?

   H_0: Home–based DCWs with higher work–related skills (e.g. training) will be less likely to report one or more work–related injuries.

   Training. A key independent variable to address research question 2 is home–based DCWs' training, measured by a scale of multiple areas of respondents training content knowledge. The internal consistency reliability estimate for this scale was Cronbach's alpha $\alpha = 0.8425$. In addition, factor analysis was conducted and confirmed the presence of only one factor strengthening the scale construct. All eleven–survey items were asked of all respondents who were still employed at the agency at the time of the survey. Respondents answered using a 5–point scale. The five–point scale was recoded to where zero represents lack of training, one "poor training", two "fair training", three

"good training", and four "excellent training". The variable was operationalized by first dividing the total sum of all 11 items into four quartiles. Second, HHAs who ranked in bottom 25 percentile were defined as having poor perception of their training. Third, HHAs who ranked in the top 75 percentile were defined as having good perception of their training. This method of operationalization is consistent with prior research and takes into account the distribution of work–related injury severity, as the sample size is very small (R. Gershon et al., 2007; Sengupta, Ejaz, & Harris-Kojetin, 2012).

3) What is the relationship between workplace environment (measured by workers' perceptions of leadership style, work design and organizational culture) and the probability of reporting one or more work–related injuries?

   H_0: Home–based DCWs working in positively rated workplace environments (as measured by workers' perceptions of leadership style, work value, time pressures, work design and organization culture) will be less likely to report one or more work–related injuries or severe injuries, as compared with workers working in a negatively rated workplace environment.

Work environment. The primary key independent variable to analyze research question 3 was work environment, measured by five separate variables.

Leadership style. The first measure of work environment was leadership style, measured as a scale of four survey items that asks home–based DCWs to reflect on their supervisors' clarity of instructions, listening, support of career progress and recognition. Respondents were asked to answer on a four–point scale. The four survey items were asked of all respondents who were still employed at the agency at the time. The scale was operationalized by first, averaging the score ranges from 0 to 3 points. Second, the mean score was calculated and used as a maximum cut point. Third, the scores were separated into quartiles that were dichotomized as low support (0–2.5 points) and high support (>2.5). Low support consisted of HHAs who scored in the bottom 25 percentile and high support included HHAs with scores in the top 75 percentile (Arlinghaus, Caban-

Martinez, Marino, & Reme, 2013; McCaughey et al., 2012). The internal consistency reliability estimate for this scale was Cronbach's alpha $\alpha = 0.80$. All missing values were excluded from the analysis.

***Work design*.** The second measure of work environment was work design, measured by one survey item that asked all home–based DCWs who were still employed at the agency at the time of the survey to indicate their patient assignments (Burgio, Fisher, Fairchild, Scilley, & Hardin, 2004; Rahman, Straker, & Manning, 2009). Respondents had an option between three pre–coded categories: a) same patients, b) patient change, or c) combination. All missing values were excluded from the analysis.

***Time pressures*.** The third measure of work environment was time pressures, as measured by a scale of two survey items that asked all home–based DCWs who were still employed at the agency whether they had enough time to provide individual attention to their patients and to complete other duties that do not directly involve patient handling. Respondents answered both questions on a 3–point Likert scale using pre–coded categories: a) more than enough time, b) enough time or c) not enough time. The variable was recoded as zero "not enough time", one "enough time" and two "more than enough time". The scale was operationalized by first, averaging the score ranges from 0 to 2 points. Second, the mean score was calculated and used as a maximum cut point. Third, the scores were separated into quartiles that were dichotomized as high time pressure (0–1.5 points) and low time pressure (>1.5). High pressure consisted of HHAs who scored in the bottom 25 percentile. Low pressure describes HHAs with scores in the top 75 percentile. The internal consistency reliability estimate for this scale was Cronbach's alpha $\alpha = 0.68$, which is slightly below the recommended value of 0.7; however, it is still

within the acceptable range (Black & Porter, 1996; Nunnally, 1978). All missing values were excluded from the analysis.

Work value. The fourth measure of work environment was work value, as measured by respondents' perception of whether their supervisors and organizations valued the home–based DCWs work using two survey items–3–point Likert scale, a) very much, b) somewhat or c) not at all. These items were asked to all current respondents and recorded as 0 "not at all" 1 "somewhat" and 2 "very much". The scale was operationalized by first, averaging the score ranges from 0 to 2 points. Second, the mean score was calculated and used as a maximum cut point. Third, the scores were separated into quartiles that were dichotomized as low work value (0–1.5 points) and high work value (>1.5). Low work value consisted of HHAs who scored in the bottom 25 percentile and high work value were those HHAs with scores in the top 75 percentile. The internal consistency reliability estimate for this scale was Cronbach's alpha $\alpha = 0.66$, which is slightly below the recommended value of 0.7; however, it is still within the acceptable range (Black & Porter, 1996; Nunnally, 1978). All missing values were excluded from the analysis.

Organizational culture. The fifth and final measure of work environment was organizational culture, as measured by a scale using eight survey items answered by a 4–point Likert scale. The scale was operationalized by first, averaging the score ranges from 0 to 3 points. Second, the mean score was calculated and used as a maximum cut point. Third, the scores were separated into quartiles that were dichotomized as poor organizational culture (0–2.5 points) and good organizational culture (>2.5). Poor organizational culture consisted of HHAs who scored in the bottom 25 percentile, while

good organizational culture describes HHAs with scores in the top 75 percentile. The internal consistency reliability estimate for this scale was Cronbach's alpha $\alpha = 0.74$. The four survey items were asked of all respondents who were still employed at the agency at the time of the survey**.** All missing values (n=62) were excluded from the analysis.

4) What is the relationship between ergonomic workplace factors and the probability of reporting one or more work–related injuries?

   H_0: Home–based DCWs who indicate the use or consistent presence of a lifting device or other devices when needed will be less likely to report one or more work–related injuries or severe injuries.

Ergonomic workplace factors. The primary key independent variable to analyze research question 4 was ergonomic workplace factors, measured by three separate variables.

Use of a lifting device. An independent variable to explore research question 4 was the use of a lifting device, measured by home–based DCWs' self–reported use of lifting devices to assist in patient handling. One survey item was asked of all the respondents who were still employed at the agency at the time of the survey. Yes responses were coded as 1 and No responses were coded as 2 and recoded as 0. All missing values (n=62) were excluded from the analysis.

Presence of a lifting device. An independent variable to explore research question 4 was the presence of a lifting device, measured by home–based DCWs' self–reported availability of required lifting devices when needed. Again, one survey item was asked of all the respondents who were still employed at the agency at the time of the survey and positively responded to the types of injury question. All missing values (n=62) were excluded from the analysis.

Other equipment needed. An independent variable to explore research question 4 was about other needed equipment needed, measured by home–based DCWs' self–reported availability of other needed equipment that is accessible. Again, one survey item was asked of all the respondents who were still employed at the agency at the time of the survey. Yes responses were coded as 1 and No responses was coded as 2 and recoded as 0. All missing values (n=62) were excluded from the analysis.

3.4 ANALYSIS

First, I examined univariate and bivariate descriptive statistics of home–based DCWs characteristics, occupational injury occurrence, type and severity using Wald chi–square test for categorical variables and t–tests for continuous variables (RQ1). Then chi–square test was used to determine the significant association among work–related injury occurrences, injury severity, training, and home–based DCW characteristics. Similarly, chi–square test was used to examine the relationships between workplace environments and worker–related injuries. The variables for gender and primary language were removed since approximately 95% of the sample was female and spoke English. Last, I analyzed the outcome variables across levels using bivariate analyses and calculated Cronbach's alphas for work environment, as measured by leadership style, work value, time pressures, work design and organization culture.

Next, I used a multivariable modeling techniques to investigate the significant predictors of outcomes. I utilized a multi–variable weighted ordinal logistic regression model (RQ2–RQ4) to predict reported workplace injury risk (e.g., back injuries including pulled back muscles, other strains/pulled muscles, animal bites, black eyes and other bruising, falls, needle sticks, personal injuries and injuries associated with cars) by

training, ergonomic, psychosocial and environmental factors while controlling for specific worker characteristics such as age, gender, education, income and race. I used a three–step approach to determining the best–fit model (Tabachnick & Fidell, 2007). First, I ran three models for each dependent variable: (a) a full model of all the variables; (b) a reduced model of only the significant covariate variables with p–value ≤ 0.15; and (c) a reduced model of only the significant covariate variables with p–value ≤ 0.05. Second, I used the goodness–to–fit test to determine the best model. I estimated separate models for the outcome variables while controlling for the key independent variables and significant covariate. For all models, I recorded odd ratios, 95% confident intervals, and p–values. The overall model formula was:

$$\text{Logit } (Y = 1) = \beta^{\circ} + \beta^{1}\chi_{j}^{1} + \beta^{2}\chi_{j}^{2} + \beta^{3}\chi_{j}^{3} + \varepsilon$$

where,

χ^1 = Socio–Demographic Characteristics; χ^2 = Job Characteristics;

χ^3 = Agency Characteristics; β = Regression Coefficients; ε = Error Term;

Y = Outcome; and $j = j^{th}$ HHA

3.5 LIMITATIONS

An inherent limitation of data collected using a cross–sectional survey design is that conclusions regarding causation (cause and effect) cannot be determined. Other limitations attributed to the study design include the presence of highly structured close–ended questions using pre–determined response formats and the absence of open–ended questions to collect additional useful information. In addition, as with any survey collection process, there are several threats to internal validity that include selection bias, participation history and response bias. The study's findings may be negatively affected

by the inherited differences between participants who agreed to the survey and those who did not. Another limitation is in the generalizability of the study because all the agencies that participated in the survey were Medicare–certified and post–survey adjustments were not successful in adjusting for differences between agencies certification status (Bercovitz et al., 2011; Krieger, Smith, Naishadham, Hartman, & Barbeau, 2005). However, since on average 85% of home health agencies are Medicare–certified, the findings of the study can be applied to the majority (National Center for Health Statistics, 1992-2009).

Table 3.1 Covariate Variables From the 2007 NHHAS

	Assigned Values
Socio–demographic characteristics	
Race	White, non–Hispanic; non–White
Education	< High school/GED; some college or more
Age	≤ 44 y/o; 45+ y/o
Household income	< 30k; $40k–$50k; > $50k
Marital status	Married/living with partner; never married;
Children in household ≤ 17	0 children; 1 child; 2+ children
Job characteristics	
Place of care delivery	Patient homes; inpatient facilities or mixed
Hourly pay rate	Low; average; high
Employment status	Full time≤30; part time> 30
Hours worked per week	<15 hrs; <30 hrs; <45 hrs 45+ hrs
Job experience	≤ 5 yrs.; 6+ yrs.
Health status	Good; poor
Time at current job	<1 year; 1+ years
Number of jobs in the last 5 years	1 job; 2+ jobs
Number of current employers	1 employer; 2+ employers
Agency characteristics	
Location	Urban; large rural; small rural
Agency type	Home health; hospice; mixed
Ownership status	For profit; not for profit
Chain affiliation	Chain; no chain

Table 3.2 Variables Used in Analysis, By Research Question

	RQ1	RQ2	RQ3	RQ4
Dependent Variables				
Types of occupational injury	X			
Injury Severity	X	X		
Work–related injury	X	X	X	X
Independent Variable				
Training		X		
Work environment			X	
Leadership style			X	
Work Value			X	
Time pressure			X	
Work design			X	
Organizational culture			X	
Ergonomic workplace factors				X
Use of lifting devices				X
Presence of lifting devices				X
Other equipment needed				X
Covariates				
HHAs characteristics				
Race	X	X	X	X
Education	X	X	X	X
Age	X	X	X	X
Household income	X	X	X	X
Marital status	X	X	X	X
Children in household ≤ 17	X	X	X	X
Health status	X	X	X	X
Job characteristics				
Place of care delivery	X	X	X	X
Job experience	X	X	X	X
Hours worked per week		X		
Employment status	X	X	X	X
Number of jobs past 5 years	X	X	X	X
Time at current job	X	X	X	X
Hourly pay rate	X	X	X	X
Number of current employers	X	X	X	X
Agency characteristics				
Location		X	X	X
Agency type		X	X	X
Ownership status		X	X	X
Chain affiliation		X	X	X

Table 3.3 Exact Wording of Items From the 2007 NHHAS to Create Training, Environmental, and Ergonomic Scales

	Exact wording
Types of injuries	Since you started your job with [AGENCY]…have you had any… a) Back injuries including pulled back muscles? b) Other strains or pulled muscles? c) Human bites? d) Animal bites? e) Scratches, open wounds or cuts? f) Black eyes or other types of bruising? g) Burns? h) Other injuries from your job?
Work–related injury	Since you started your job with [AGENCY] have you had any/during the past 12 months, how many different times were you hurt or injured while working for [AGENCY]?
Injury severity	Since you started your job/During the past 12 months, in total how many days were you unable to work because of the injuries?
Training	I'd like you to think about all the home health aide training you have had, including training to become a home health aide and any training you received since you started working in the field. For each area, please tell me whether the training you received was excellent, good, fair or poor. If you have not received training in an area, just tell me. a) Patient care skills such as helping with eating, bathing, dressing and walking b) Talking with residents c) Discussing patient care with patients' families d) Organizing your work tasks so that everything gets done on time e) Dementia care f) Working with patients that act out or are abusive g) Preventing personal injuries at work h) Assisting with duties that don't directly involve patients, such as meal planning or care of the home i) End of life issues and coping with grief j) Abuse and neglect issues k) Relating to patients of different cultures or ethnicities or with different values or beliefs
Use of lifting device	Since you started your job at [AGENCY] have you ever used lifting devices when moving or lifting patients who cannot move around on their own?
Presence of lifting device	How often are lifts present in patients' home when they are needed?

Table 3.3 Continued

	Exact wording
Need other devices	Aside from lifts, are there any other devices or equipment that you need to make your job safer that is typically missing in patients' homes?
Leadership style	Please tell me if you strongly agree, somewhat agree, somewhat disagree or strongly disagree with each statement. My supervisor… a) …provides clear instructions when assigning work b) …is supportive of progress in my career, such as further training c) …listens to me when I am worried about a patient's care d) …tells me when I am doing a good job
Work design	Are you assigned to care for the same patients on most weeks you work or do the patients you are assigned to change each week you work?
Time pressures	1. Now I'd like to ask you about things you do directly with patients such as helping them dress, bathe, get in and out of bed or use the toilet. During the last week worked, how much time do you have to give individual attention to patients who need this type of assistance? 2. Again, during the last week worked, how much time do you have to complete other duties that do not directly involve the patient? This would be things like meal or food preparation, laundry or record keeping
Work value	How much do you think your supervisor values or appreciate the work you do as a home health aide? and I4: how much do you think the organization at [AGENCY] values or appreciate the work you do as a home health aide?
Organizational culture	1. ...tell me whether you strongly agree, somewhat agree, somewhat disagree or strongly disagree. a) I am respected by my agency for my work b) I am involved in challenging work c) I am trusted to make patient care decisions d) I am confident in my ability to do my job 2. If you had to decide whether to take your current job again, would you 3. How satisfied are you with current job? 4. If a friend or family member needed care and asked your advice about receiving home healthcare from [AGENCY] would you 3. If a friend or family member asked your advice about taking a home health aide job at [AGENCY] would you

CHAPTER 4

MANUSCRIPT 1

Occupational Injury Patterns and Perceived Training Among Home–Based Direct Care Workers In U.S. Home and Hospice Care Agencies[1]

[1]Hanadi Y. Hamadi, Janice C. Probst, Jessica D. Bellinger, M. Mahmud Khan, Candace N. Porter. To be submitted to *Gerontology & Geriatrics Education.*

ABSTRACT

Home–based direct care workers (DCWs) work in a high–risk and demanding industry, serving individuals who are not able to function independently to complete Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs). The unique workplace environment of home–based DCWs consists of the patient's home, which places them at varying nature and risk factors for injury. To our knowledge, no studies have extensively described and profiled the occupational injury patterns and training among this workforce group. The main objectives of the study are to profile occupational injury patterns across home health and hospice care (HHC) organizational characteristics, home–based DCWs individual characteristics and examine how worker training affect HHA risk for reporting an occupational injury. The study involved cross–sectional analysis of secondary data from the 2007 National Home Health Aide Survey (NHHAS) conducted by the National Center for Health Statistics. The study sample consisted of a nationally represented sample of home health aides (n = 3,377). HHAs' training was measured using an 11–item scale of multiple training topic areas. Univariate and bivariate analysis was conducted to describe injury patterns across individual, job, and organizational factors. Multivariable logistic regression was used to determine whether perceived training is a predictor of worker–reported occupational injury and severity. Over half of HHAs perceived that their training across multiple topic areas had provided them with excellent skills to care for their patients. However, this training was not a risk factor for work–related injury. Holding other variables constant race, hours worked per week, and number of current employers were found to be risk factors for occupational injury. The prevalence of injury reporting was lower in non–White and part

time employed HHAs consistent with findings of previous studies. In addition, race, education level, hourly pay rate and agency location, type, and ownership status were found to affect HHAs risk for work–related injury severity. The lack of relationship between perceived training and reported work–related injury sheds light on the importance of exploring the content and appropriateness of the training received and assessing the rational of the positive perceptions to better develop injury prevention programs and reduce the work injury in this fast growing population.

INTRODUCTION

Overall, all direct healthcare workers (DCWs) or home health aides (HHA) are at a higher risk for occupational injury than the general workforce. Hazards are commonly present in their work environment, and they are continuously exposed as they complete their job duties (Zontek et al., 2009). Hazards consist of any source of potential damage, harm, or adverse effect (Zartarian, Ott, & Duan, 1997). This high risk and the presence of hazards deemed the healthcare industry as a high–risk industry similar to miners; heavy and tractor–trailer truck drivers; police officers and sheriff's patrol officers and construction workers (Shire, Marsh, Talbott, & Sharma, 2011).

The home–based direct care workforce is at particular risk for occupational injury due to the uniqueness of their workplace environment, the patient's home. The patient's home environment presents challenges to the workers that significantly differ from that of DCWs in an institutional setting. Their job duties and responsibilities are more conducive to risks for workplace injuries because they lack the ability to control unforeseen hazards in an unstable work environment (Stonerock, 1997). Their patients are individuals with functional limitations who require assistance to complete Activities of Daily Living

(ADLs) and Instrumental Activities of Daily Living (IADLs) (Noel et al., 2000, p. 245). The job tasks required are a product of agency characteristics and worker characteristics, knowledge and skill (Mittal, Rosen, & Leana, 2009).

Exposure to hazardous job duties and responsibilities has been linked to both fatal and nonfatal occupational injuries. Nonfatal workplace injuries have specifically been associated with negatively affecting worker and organizational productivity, quality and performance (Hayes et al., 2006; P. W. Stone et al., 2007). Safety training and injury prevention programs have not been shown to reduce the above average–injury rate of 424 per 10,000 full time employees as compared to a national average of 117 per 10,000 full time employees–experienced by home–based DCWs. This is of concern since home–based direct care is the second–fastest growing sector in the United States. However, information is particularly scarce about provider well–being and safety in this setting (Leff et al., 2000; United States Bureau of Labor Statistics, 2012c, 2012e; United States Occupational Safety and Health Administration, 2012).

BACKGROUND

The largest employer in the United States is the overall healthcare system, employing 8.8 million individuals and approximately 12 to 19% of those are employed within the home–based healthcare sector (Brault, 2012; United States Bureau of Labor Statistics, 2012b). There is a direct relationship between the number of home–based DCWs and individuals needing their home healthcare services. Current workforce forecasting shows an anticipated growth in the number of individuals requiring assistance with ADLs and IADLS to 54 million by 2020 and an increase demand for formal or paid

home–based caregivers (Sandra L Mcginnis & Moore, 2013; The National Association for Home Care and Hospice, 2010).

In 2011, there were four million home–based DCWs, and the number is anticipated to increase by 93% by 2020 (United States Bureau of Labor Statistics, 2012e). Beyond the existing direct relationship between the ratio of caregiver to patient, the Health Resources and Service Administration (HRSA) identified three main contributors to the increased need for DCWs and long–term care (LTC): (a) Increased life expectancy of individuals with one or more chronic conditions; (b) Aging population and baby boomers; and (c) Increased access and availability of resources within communities' services (Agency for Healthcare Research and Quality, 2001). Therefore, home–based DCWs will be required to provide home healthcare services to patients who are older and sicker with multiple chronic conditions, increasing the workers' risk for exposure to hazards and occupational injury (Bayliss et al., 2014; Hootman et al., 2006; R. I. Stone & Barbarotta, 2010).

Contrary to popular belief, direct care professionals including home–based DCWs experience lower–than–average occupational health and experience a high rate of work–related injury. Worker–related injury is defined as any condition of physical injury sustained by an employee related to performing work duties and responsibilities that required medical attention or resulted in days away from work (Wing et al., 2004). Home–based DCW reported work–related injury account for 20% of the total reported injuries (United States Bureau of Labor Statistics, 2012e). As this sub–category of the workforce continues to grow, it is becoming difficult to ensure the workers' health and safety (Houston et al., 2013). Ensuring their occupational well–being is a critical part of

the worker's health organization's success and patient quality of care (P. W. Stone et al., 2007). One key barrier is the high turnover rate costing the LTC system $4.1 billion, approximately $3,500 per home–based DCW (Seavey, 2004, 2010). In 2003, 40 out of the 50 states indicated home–based DCW shortage as a major public health concern (Gropelli & Corle, 2011; P. W. Stone et al., 2007). The persistence in high turnover rate and vacancy among this workforce category is negatively affecting its ability to perform required tasks effectively and safely.

Other elements increase the risk of home–based DCWs to experience a work–related injury. These elements are referred to as risk factors, defined as any attribute or characteristic of exposure (individual organizational or environmental) that increases the risk of workers sustaining an injury or an illness (Gropelli & Corle, 2011; Miller, 2013). Worker–specific risk factors that have been associated with occupational injury include worker demographic, socioeconomic characteristics and training skills and knowledge (Oliver, Cheyne, Tomas, & Cox, 2002). The intra–relationship between these factors affect the workers' ability to provide care to the patient, which is vital since the leading cause of injury among home–based DCWS is manual handling of patients, which commonly leads to musculoskeletal disorders (MSDs) or back injuries (Gropelli & Corle, 2011).

Training Risk Factors

The mandatory federal training requirements have not changed for HHAs since they were established over 20 years ago. These requirements do not include training; thus, HHAs traditionally have little to no training before beginning to care for patients (Cohn, Horgas, & Marsiske, 1990; Sengupta et al., 2012). Approximately 68% of HHAs

have had less than an hour of training, and 60% have quit due to lack of preparedness for the physical and emotional demands of the job (Libert et al., 1991; Sofie, 2000). Many training programs provide few opportunities for hands–on experience and many do not reflect the complex needs of today's aging population. Training requirements and contact hours also vary by state and range from 75 to 120 hours, which can make cross–state comparison challenging (Paraprofessional Healthcare Institute PolicyWorks, 2013). Research has documented that the lack of training standardization negatively impacts HHAs' attitudes, perception and knowledge of patient care to provide high–quality care and safety (Gettle, 2009). Research has shown that worker's perception of on–the job training and knowledge skills in key competency areas is associated with higher levels of job satisfaction and lower risk for occupational injury (Ejaz, Noelker, Menne, & Bagaka's, 2008).

RESEARCH QUESTIONS

A significant gap in the body of the literature exists, where no studies to our knowledge have extensively described and profiled the occupational injury patterns among home–based DCWs. However, few studies attempt to describe broad summary findings of home–based DCWs' work–related injury patterns in the process of examining associations between transformational leadership, injury prevention training efforts, use of ergonomic principles and the risks for occupational injury among home healthcare DCWs (Bercovitz et al., 2011; Traci Galinsky et al., 2013; D. Lee, 2012; McCaughey, DelliFraine, McGhan, & Bruning, 2013; McCaughey et al., 2012). Thus, the objective of this study was to establish a baseline for home–based DCWs' by profiling and describing

occupational injury patterns across their personal characteristics, agency characteristics and places of care delivery. The primary research question of this study were:

1) What different types of occupational injuries and severities that are reported by home–based DCWs?

    c) How do injury patterns vary by personal characteristics (e.g., race, education, hold multiple jobs, etc.)?

    d) How do injury patterns vary by the place of care delivery (e.g., patient homes only, one or more inpatient facilities only or both)?

2) What is the relationship between home–based DCW training and (a) the probability of reporting one or more work–related injuries and (b) the degree of injury severity?

METHODS

Study Design and Population

This study used a secondary cross–sectional design to analyze a nationally representative sample of home–based DCWS from the 2007 National Home Health Aides Survey (NHHAS). The dataset public file is available for download from the Centers for Disease Control and Prevention's (CDC) main website. The primary data collection was completed by the CDC's National Center for Health Statistics (NCHS) between August 2007 and February 2008. The samples were obtained using a stratified, multistage probability design. The sampling frame for the eligible agencies was obtained from the 2007 National Home and Hospice Care Survey (NHHCS). The 2007 NHHCS was part of a series of nationally representative surveys started in 1992 by NCHS. The survey was developed to profile and provide insight information on home and hospice care agencies, their staff and their patients. Prior to 2007, the survey contained only three modules: (a) an agency module (AQ); (b) a patient health module (PH); and (c) a patient charges and payments module (PA).

For the NHHCS, 1,545 agencies were randomly selected from approximately 15,000 home health, hospice and mixed (both services) agencies in the United States; 1,036 participated. During the 1,036 in–person interviews with agency representatives, employee directories were obtained. Data were then entered into the Computer–Assisted Personal Interviewing system (CAPI). The 2007 NHHAS used CAPI to randomly identify and interview up to six HHAs across 1,036 home health, hospice, and mixed agencies. A total of 4,416 eligible aides were selected and 3,377 completed the telephone interviews from 955 agencies, a response rate of 72% (Bercovitz et al., 2011). The main objective of the 2007 NHHAS was to gather nationally representative baseline descriptive estimates of the HHAs. The survey instrument included sections on work–related injury type and severity, agency structural characteristics, family life, job history and demographic statistics. A secondary objective was to gather data that could be compared to the 2004 National Nursing Assistant Survey (NNAS) in effort to gain a representative description of DCWs in LTC (Bercovitz et al., 2011). The research presented here was reviewed and categorized as “exempt” by the Institutional Review Board of the University of South Carolina.

Variables

Dependent Variables

Three outcome variables were examined. The first item asked all respondents if they had experienced a back injury, including pulled muscles, other strains, human or animal bites, scratches, bruises, burns, or any other injuries. The second variable was work–related injury, measured by six categories. “Injury "was defined as an injury reported to the agency or that required medical attention or that caused missed workdays.

Work–related injury was operationalized such that inapplicable/not ascertained was deemed to imply not injured (0 incidents of injury) and reporting one or more incidents of injury equates to being injured (McCaughey et al., 2012).The third variable was injury severity, measured by home–based DCWs' self–reported days of work missed because of injuries. The variable was operationalized in accordance with the Bureau of Labor Statistics into high– and low–injury severity using the average number of missed work days (9 days) as the cutoff point (United States Bureau of Labor Statistics, 2012b).

Independent Variables

The healthcare training measure addressed 11 competencies: patient care skills; talking with patients; talking with families; organizing work tasks; dementia care; working with abusive patients; preventing personal injury; duties that do not directly involve patients; end–of–life issues, abuse and neglect issues; and cultural competency. Respondents answered using a 5–point scale. The five–point scale was recoded to set zero as "lack of training"; one "poor training"; two "fair training"; three "good training"; four "excellent training". The mean score of the scale was used in the analysis. All of the 11–items were used to develop the training scale. The internal reliability estimate for this scale was acceptable with a Cronbach's alpha $\alpha = 0.8425$ (Nunnally, 1978). Factor analysis was conducted and confirmed the presence of only one factor (Eigenvalue = 4.08)strengthening the scale construct. The mean score of all 11–survey items was then dichotomized. Poor training consisted of scores ranked in the bottom 25% and good training included was scores ranked in the top 75 percentile.

Control Variables

Workers' self–reported socioeconomic and demographic variables were utilized as covariates in the profiling of occupational injury patterns. These characteristics include: race (coded as non–Hispanic, White, Black, Hispanic of any race and other), education, age, gender, household income, marital status, number of children in household ≤ the age of 17, place of care delivery (coded as Home Health, Hospice and both or mixed), hourly pay rate (coded as low, average and high hourly pay rate) job experience, employment status (full time or part time), hours worked per week (<15hrs, <30hrs, <45hrs, or 45+hrs), health status, time at current job, number of jobs in the last 5 years, number of current employers, primary language (measured to reflect the diversity of the home–based direct care workforce and its effect on patient/worker communication). HHAs' gender and primary language were not controlled for because approximately 95% of the sample was female and spoke English.

Lastly, agency–specific variables were utilized to understand the impact of agency characteristics on occupational injury patterns. In the public version of the 2007 NHHAS, there were a limited number of agency characteristics that consisted of agency location (coded as metropolitan, metropolitan or large rural and small rural), type of ownership status (for profit and other) and chain affiliation.

Data Analysis

All analyses were conducted using STATA (Version 12.0, STATA Corporation, College Station, Texas USA) to account for the complex, weighted, and clustered structure of the sample design. An alpha (α) level of 0.05 was used to determine statistical significance. Univariate and bivariate analyses using frequencies, percentages,

means, median and standard deviations were conducted to describe home–based DCWs' work–related injury patterns across individual and organizational factors. Parametric and non–parametric tests were calculated to determine and identify differences in reporting and severity of occupational injury between the different individual socio–demographic and organizational characteristics. Multivariable logistic regression was used to determine whether perceived training is a predictor of worker–reported occupational injury and severity.

RESULTS

Characteristics of the HHA Population

Demographic characteristics of HHAs, their jobs and the home health agencies that employ them, as well as the association of these characteristics with work–related injuries, are presented in Table 4.1. The study population was overwhelmingly female (95%) and identified English as the primarily spoken language (94%) (data not in Table 4.1). Less than 20% worked in mixed or inpatient facilities and the majority (80%) worked in patient homes. Three–quarters of HHAs were employed by a home health agency, and only 25% were working for hospice or mixed agencies. The participants were mostly full time employees (59%) and had one employer (73%) and over six years of home health experience (70%). More than half of HHAs were White and non–Hispanic with a high school education or less. Only 40% had some college or more education. The average income of this study population was less than $30,000.

Prevalence of Work–Related Injury

The bivariate analysis of HHAs, job and agency characteristics as related to work–related injury is illustrated in Table 4.1. Among HHAs' demographic

characteristics, race ($p = 0.001$) and education ($p = 0.034$) were significantly associated with work–related injury. White HHAs reported more work–related injuries than non–White (16.06% vs. 6.84%). Approximately 15% of injured HHAs had some college education, while only 9% had high school education or less. HHAs' job characteristics were explored and HHAs' employment status (full time or part time), the number of jobs they held, hourly pay rate and place of care delivery were associated with work–related injury. Persons in mixed or in–patient facilities (21%) had at a higher proportion of reported injuries than persons working in patient homes (9%). HHAs who were employed full time reported more injuries (15%) than part time HHAs (5%). Workers with only one job (14%) reported more injuries than workers with more than one job (4%). As for hourly pay rate, the majority of reported work–related injuries were by HHAs who had either an average or high hourly pay rate (14%). Less than 10 percent (6.5%) of low hourly wage employees reported a work–related injury, compared to the 93% who were not injured. Among agency characteristics, HHAs working for home health agencies had a lower frequency of reported injuries (8.8%) than their counterparts working in hospice (18%) or mixed agencies (19%). In addition, HHAs at not for profit agencies had a higher frequency of reported injuries than those at for profit home health agencies, whereby 17% and 8% were injured, respectively.

Injury Severity among Injured HHAs

The degree of severity of reported work–related injuries, as measured by the number of missed days of work, and the associations with demographic, job and agency characteristics are shown in Table 4.2. After examining HHAs' demographic characteristics, race, education, and health status were found to have a significant

association with injury severity, with associated p–values of 0.027, 0.026 and 0.043, respectively. Among all injured persons, HHAs who were non–White, had high school or less education and were in poor health had a higher percentage of injuries requiring one or more missed days of work (high severity) than zero missed days of work (low severity). No reporting differences between high and low injury severity were found among HHAs who were White, college educated and in good health.

HHAs' hourly pay rate was the only job characteristic associated with work–related injury severity. Persons with a low or average hourly pay rate sustained more injuries with high severity (70% and 76%) than injuries with low severity (29% and 23%). As for HHAs with a high hourly pay rate, no differences were identified between injuries with low and high severity. Exploring agency characteristics revealed that agency location ($p = 0.036$) was significantly associated with injury severity. Agencies located in urban or rural areas had greater but similar rates of injuries with high severity (71% and 77%). However, HHAs working in small, rural home health and hospice care agencies reported more injuries with low severity (65%) than high severity (35%).

Injury Patterns among the HHA Population

In Table 4.3, the distribution of types of injuries of the sample is reported with unweighted frequencies. The top two types of injuries sustained by the sample population that required one or more days away from work were back injury (254 injuries) and strain (212 injuries), consistent with what has been found throughout the literature. From the total 624 injuries reported, 129 of HHAs suffered burns and/or wounds, the majority of which (93 incidents) did not require any days away from work. All injury types were identified as having a statistically significant association with injury severity.

Approximately 73% of injuries that caused one or more days away from work were due to back injuries and strains and almost 26% of injured individuals with zero missed days of work had back injuries and strains (Table 4.4).

Roughly, 8% of HHAs who worked only in–patient homes reported back injuries and strains and less than 2% had other types of injuries. This number is slightly greater for those HHAs working in a mixed place of care delivery that included one or more inpatient facilities, whereby 14% reported back injuries and 8% experienced other types of injuries. In Table 4.5, the association between HHAs' place of care delivery and injury pattern is described. Work–related injury and types of injuries were significantly associated with place of care delivery. Among HHAs employed in a mixed agency, 20% (SE, 3.01) reported one or more work–related injuries. Of those who primarily provide care in patient homes, 9% (SE, 1.39) reported one or more injuries. Injury severity was found not to be associated with HHAs' primary place of care delivery.

HHAs' Assessments of Training and Knowledge

HHAs' ratings of each of the 11 training topics are listed in Table 4.6. Some of these topic areas include performing resident/patient care skills organizing work tasks, providing dementia care, and preventing injury. Approximately 50% of HHAs perceived that their training across all topics had provided them with excellent skills and knowledge to care for their patients, and another 35% perceived their training as good. Between 14% and 16% of HHAs stated that they had not received training in one or more of the topic areas or that they received poor training. Overall, HHAs perceived that the best training they received was in abuse and neglect issues and performing patient care skills. On the

other hand, training in the areas of working with abusive patients and relating to patients of different cultures received the worst rating by HHAs.

Table 4.7 presents a weighted cross tabulation between HHAs' overall assessment of training scale (good training–poor training) and work injury patterns as measured by work–related injury, injury severity and type of injury. Chi–square test results indicated that overall assessment of training did not vary significantly across all injury patterns. Thus, perceived training was not associated with HHAs' risk of injury, injury type, or severity.

Multivariate Analysis: Effects of Training and Other Risk Factors

Generalized logistic regression was used to distinguish the effects of training and the likelihood of HHAs reporting one or more work–related injuries, while holding other characteristics constant. In Table 4.8, model 1 describes the effect of perceived poor training on the risk for injury and model 2 explores the effect of poor training on injury severity. Poor training, with other characteristics held constant, had no effect on the likelihood of HHAs reporting work–related injury or the degree of injury severity.

In the first model, race, hours worked per week, and number of current employers were related to the risk for work–related injury. Non–White HHAs were 44% less likely to report work–related injuries compared to White HHAs (OR = 0.44, 95% confidence interval [CI]: 0.23–0.87). HHAs working anywhere between 30 hours to less than 45 hours per week had 3.358 times the odds of being injured than HHAs working less than 15 hours per week (95% [CI]: 1.06–10.60). Meanwhile, HHAs with more than one employer were found to be 34% less likely to report work–related injuries than HHAs with a single employer (95% [CI]: 0.15–0.78).

In the second model, the risk factors associated with low verses high injury severity were race, education level, hourly pay rate, and agency geographic location, type, and ownership status. First, non–White HHAs were at a higher rate for reporting low severity work–related injuries compared to White HHAs (OR = 3.470, 95% [CI]: 1.28–9.40). Second, college educated HHAs were found to be 26% less likely to sustain an injury with high severity than injuries with low severity (95% [CI]: 0.12–0.57) compared to high school educated HHAs. Third, HHAs with high hourly pay rate were 27% less likely to sustain an injury with high severity compared to HHAs with low hourly pay rate (95% [CI]: 0.08–0.93). Fourth, HHAs working in small rural home health and hospice agencies were less likely to report injuries requiring one or more missed days and more likely to report injuries with zero missed days or work (OR = 0.126, 95% [CI]: 0.04–0.41). Fifth, both HHAs working for hospice and mixed agencies were at a significantly less risk for reporting injuries with high severity than HHAs working in home health agencies (OR = 0.179; 0.248, 95% [CI]: 0.06–0.52; 0.09–0.71). Lastly, HHAs employed at not for profit home health and hospice care agencies were at a higher risk for injuries with high severity than low severity (OR = 2.915, 95% [CI]: 1.07–7.96).

DISCUSSION

The present study used the first nationally representative probability sample of HHAs working in LTC in the United States to describe and examine the factors associated with work–related injuries. Specifically, this study explored the associations between perceived training and both the risk for reporting a work–related injury and the severity of a reported injury. Thus, the findings of this study add to evidence gaps by providing results that can be generalized to a workforce group that had not been

previously studied in detail. Few prior studies have profiled HHAs and direct care workers, but were limited to examining agency characteristics or were based off survey instruments that were not specifically designed for HHAs (Baughman & Smith, 2008; Bercovitz et al., 2011; Diane Brannon, Barry, Kemper, Schreiner, & Vasey, 2007; Khatutsky et al., 2011). Even though two studies have investigated training and specific types of injuries, no study has exclusively explored work–related injury and severity within HHAs who primarily provide care services in patient homes (McCaughey et al., 2012; Menne, Ejaz, Noelker, & Jones, 2007).

HHAs are unique in that they work at patient homes with little to no supervision and typically alone. Unlike certified nursing aides (CNAs), not all HHAs receive appropriate training for optimal performance because training is not universally implemented by all home health agencies. This is troubling since, according to the 2016 estimates from the Bureau of Labor statistics (BLS), HHA is anticipated to be the third fastest growing occupation (United States Bureau of Labor Statistics, 2012e). Furthermore, per consumer preference and legal mandates, the current political environment is transitioning to fund more home– and community–based programs. The goal is to move the LTC system away from an institutional to a community setting. These efforts and the continuously aging United States population are likely to increase the anticipated need for HHAs (Centers for Disease Control and Prevention & National Association of Chronic Disease Directors, 2013; Smith & Baughman, 2007; R. I. Stone, 2004b).

With the scarcity of literature on work–related injury and training among HHAs, the findings of this study cannot be compared with other studies. The study had several

key findings. First, the overall conclusion was that HHAs perceived that they received "excellent" and "good" training on key topic areas that promoted safety and job knowledge, yet a relationship was found between poor training and the risk for occupational injury. The appropriateness of this training and its effect on HHAs knowledge and skill to perform their duties is not addressed in this study.

Second, the study found that the relationship between part time employees, having multiple employers and belonging to a non–White race decreased the risk of reporting one or more injuries. However, the relationship between work–related injury, race, employment status and the number of current employers might be the result of reporting trends, barriers and issues. Contributing to this issue is that many national level data have been collected on the number of full time equivalent workers employed in HHC agencies that are Medicare–certified. However, attributed to the nature of work of HHAs, many work either on a contingent or part time basis or are privately employed, suggesting that national data has underestimated the magnitude of the total number of both HHAs and injuries (Institute for the Future of Aging Services, 2007; Montgomery et al., 2005; United States Occupational Safety, 1992).

Third, when examining injury and injury severity, the study found relationships between the increased risk for low injury severity and college education, high hourly pay rate, full time employment, hospice or mixed agencies and agencies located in small rural areas. In addition, college education, hospice and mixed agencies and agencies located in small rural areas were found to have a decreased risk for injuries with high severity. Data from the BLS of percent distribution for nonfatal occupational injuries and illnesses, involving days away from work by race, show 39.4% of incidents for Whites and 21.6%

for non–Whites (United States Bureau of Labor Statistics, 2012b). A survey conducted by the American Nurse Association found that the DCW's reason for a lack of reporting was: (a) fear of termination or possible disciplinary action; (c) fear of harassment by others; (d) possible reason for inability to receive promotion or career advancement opportunities; and (e) possible development of a bad reputation among colleagues, patients or supervisors (De Castro, 2003).

In this sample, 11.7% of HHAs reported a work–related injury significantly lower than the 56% of certified nursing aides in the 2004 National Nursing Assistant Survey (NNAS) and other estimates of injuries among direct care workers (Khatutsky, Wiener, Anderson, & Porell, 2012; Kopiec, 2000; Squillace et al., 2009; Tak, Sweeney, Alterman, Baron, & Calvert, 2010). There are several rationales for this discrepancy. One of which is that HHAs often work alone, are typically unsupervised, and thus have a greater opportunity to hide an injury and not report it. This is not likely for CNAs who work with other individuals and are directly supervised by a registered nurse (RN), Licensed Practical Nurses (LPN) or Licensed Vocational Nurses (LVN). This is evident in Table 4.8, where HHAs working in mixed or in–patient facilities had the highest rate of reported injury (OR = 2.08, [CI]: 0.84–4.94). The findings of this study shed light on the importance of the work environment and its effects on worker safety and wellbeing. Furthermore, the results presented here are in agreement with other studies suggesting the linkage between worker's complex personal, job and agency characteristics.

LIMITATIONS

This study had several limitations. First, the study utilized a cross–sectional design and was derived from a secondary analysis, inhibiting the ability to determine

causal inference. Future studies using a longitudinal design will help mitigate this limitation. The national survey was not specifically designed to measure or evaluate work–related injury and severity and lacked the ability to identify and examine the causal risk of injury.

Second, the sample and collection method also impacted the study's limitations. The survey heavily relied on self–reported data by asking respondents to recall information. As a result, the provided information may be subject to several biases. A study of hospital clinical staff reported that over one–third of the staff did not report injuries because they were perceived to be minor and as a part of the job description. Of the unreported injuries, 64% of unreported injuries required medical attention, and 44% resulted in one or more lost workdays (Weddle, 1996). This is concerning since intuitional settings have well established surveillance and injury reporting policies compared to the home setting (Lorenzen & Itkin, 1992). Third, the study respondents were all employed by agencies; however, as stated earlier, many in the HHA workforce are privately employed and are not represented in the sample population. Furthermore, all agencies that participated in the survey were Medicare–certified and post–survey adjustments were limited in mitigating the differences between agency certification statuses, reducing the study's generalizability to Medicare–certified agencies.

Lastly, the inability to examine and evaluate the reported injury affected the study's findings. In risk factor assessment, examining how the injury occurred is instrumental in the development of an appropriate prevention program. The study found no relationship between reported work–related injuries and perceived training. However, the most incentivized approach to promoting worker safety and reducing occupational

injury is training, and it has been used for many years to address unsafe behavior (Diane Brannon et al., 2007; Service Employees International Union, 1995). The lack of relationship in our study can be explained by the method of which the training is implemented. Most of the HHA training occurs in a classroom setting with minimal hands–on experience, which has shown to be critical in improving care delivery (Paraprofessional Healthcare Institute PolicyWorks, 2013; Sengupta et al., 2012; Yeatts, Cready, Swan, & Shen, 2010).

Future research is warranted to examine the effects of HHA work–related injury and workplace outcomes, since they are underrepresented in the body of the literature. Future studies should expand on this by exploring the implications of worker satisfaction and the turnover on work–related injuries among this subgroup of workers. Finally, future studies need to expand on the notion of training by exploring the types and methods of worker training to appropriately identify the optimal form of training to significantly reduce occupational injury.

Table 4.1 Socio–Demographic, Job and Agency Characteristics of HHAs in the National Home Health Aide Survey

	All HHAs n = 3,377	Not injured n = 2,751	Injured n = 624	P value[1]
	% (SE)	% (SE)	% (SE)	
	f=100%	*f*=88.67%	*f*=11.33%	
Socio-demographic characteristics				
Age				0.352
≤44 y/o	43.54 (2.50)	89.83 (1.61)	10.17 (1.61)	
45+ y/o	56.46 (2.50)	87.77 (1.78)	12.23 (1.78)	
Race				0.001**
White, non–Hispanic	50.95 (3.29)	83.94 (2.19)	16.06 (2.19)	
Non–White	49.05 (3.29)	93.16 (1.43)	6.84 (1.43)	
Marital status				0.919
Married	50.97 (2.60)	88.64 (1.72)	11.36 (1.72)	
Not married	49.03 (2.60)	88.37 (2.01)	11.63 (2.01)	
Education				0.034*
High school, GED or less	59.89 (2.18)	90.60 (1.32)	9.40 (1.32)	
Some college or more	40.11 (2.18)	85.41 (2.38)	14.59 (2.38)	
Household income (US$)				0.474
Less than 30k	49.47 (2.54)	89.87 (1.60)	10.13 (1.60)	
30k–50k	32.98 (2.19)	86.45 (2.82)	13.55 (2.82)	
Above 50k	17.55 (1.88)	87.41 (2.91)	12.59 (2.91)	
Children in household				0.401
0 children	52.09 (2.15)	88.48 (1.84)	11.52 (1.84)	
1 child	20.45 (1.71)	85.81 (3.11)	14.19 (3.11)	
2+ children	27.47 (2.11)	90.55 (1.97)	9.45 (1.97)	
Health status				0.743
Good health	63.30 (2.32)	88.82 (1.72)	11.18 (1.72)	
Poor health	36.70 (2.32)	87.98 (1.92)	12.02 (1.92)	
Job characteristics				
Employment status				<0.001**
Part time (≤30 hrs.)	40.53 (2.49)	94.47 (1.28)	5.53 (1.28)	
Full time (>30 hrs.)	59.47 (2.49)	84.7 (2.03)	15.3 (2.03)	
Job experience				0.573
≤ 5yrs.	29.58 (2.20)	89.56 (2.03)	10.44 (2.03)	
6+ yrs.	70.42 (2.20)	88.29 (1.46)	11.71 (1.46)	
Time at current job				0.416
≤ 5yrs.	63.10 (3.18)	89.16 (1.54)	10.84 (1.54)	
6+ yrs.	36.90 (3.18)	86.84 (2.49)	13.16 (2.49)	
Jobs in past 5 yrs.				0.11+
1 job	31.51 (2.88)	85.48 (2.58)	14.52 (2.58)	
2+ jobs	68.49 (2.88)	90.11 (1.52)	9.89 (1.52)	

Table 4.1 Continued

	All HHAs n = 3,377 % (SE) *f*=100%	Not injured n = 2,751 % (SE) *f*=88.67%	Injured n = 624 % (SE) *f*=11.33%	P value[1]
Number of current employers				<0.001**
1 employer	73.00 (2.41)	85.91 (1.67)	14.09 (1.67)	
2+ employers	27.00 (2.41)	96.09 (1.00)	3.91 (1.00)	
Hourly pay rate				0.015*
Low	37.71 (4.34)	93.43 (1.52)	6.57 (1.52)	
Average	25.11 (2.89)	85.82 (3.09)	14.18 (3.09)	
High	37.18 (3.85)	85.71 (2.29)	14.29 (2.29)	
Place of care delivery				<0.001**
Patient home	80.96 (1.88)	90.94 (1.39)	9.06 (1.39)	
Mixed or in–patient	19.04 (1.88)	79.04 (3.01)	20.96 (3.01)	
Agency characteristics				
Location				0.436
Urban	84.02 (1.72)	88.8 (1.52)	11.2 (1.52)	
Rural	10.40 (1.40)	89.56 (1.92)	10.44 (1.92)	
Small rural	5.58 (0.85)	85.02 (2.85)	14.98 (2.85)	
Agency type				<0.001**
Home health	74.19 (2.62)	91.21 (1.56)	8.79 (1.56)	
Hospice	12.44 (1.25)	81.09 (2.16)	18.91 (2.16)	
Mixed	13.37 (2.16)	81.65 (3.35)	18.35 (3.35)	
Ownership status				0.001**
For profit	63.28 (4.09)	91.84 (1.47)	8.16 (1.47)	
Not for profit	36.72 (4.09)	83.21 (2.34)	16.79 (2.34)	
Chain affiliation				0.093+
Chain	29.95 (4.01)	91.78 (1.84)	8.22 (1.84)	
No chain	70.05 (4.01)	87.33 (1.68)	12.67 (1.68)	

Notes: An unweighted sample of 3,377 and weighted sample of 160,720 HHAs were used in this analysis. All percentages are weighted to reflect the population. Standard errors were calculated to determine the precision of injury estimates.

[1]Significant differences based on $\chi 2$.

+ P<0.15

* P <.05

** P <.01

Data source: NHHAS, 2007.

Table 4.2 Injuries and Their Severity Among HHAs in the 2007 NHHAS

	All injured HHAs n = 624 % (SE) *f*=100%	Injured with 0 missed days of work[2] n = 310 % (SE) *f*=40.03%	Injured with 1+ missed days of work[2] n = 314 % (SE) *f*=59.97%	P value[1]
Socio-demographic characteristics				
Age				0.287
≤44 y/o	39.15 (5.03)	46.96 (8.77)	53.04 (8.77)	
45+ y/o	60.85 (5.03)	35.79 (6.25)	64.21 (6.25)	
Race				0.027*
White, non–Hispanic	70.82 (5.26)	45.86 (6.78)	54.14 (6.78)	
Non–White	29.18 (5.26)	25.16 (6.01)	74.84 (6.01)	
Marital status				0.391
Married	50.26 (5.99)	44.67 (5.9)	55.33 (5.9)	
Not married	49.74 (5.99)	35.06 (9.4)	64.94 (9.4)	
Education				0.026*
High school, GED or less	49.17 (5.63)	28.74 (4.8)	71.26 (4.8)	
Some college or more	50.83 (5.63)	50.52 (8.78)	49.48 (8.78)	
Household income (US$)				0.221
Less than 30k	42.85 (6.10)	29.15 (5.08)	70.85 (5.08)	
30k–50k	38.24 (6.34)	48.77 (12.38)	51.23 (12.38)	
Above 50k	18.90 (4.00)	39.14 (8.19)	60.86 (8.19)	
Children in household				0.799
0 children	52.19 (5.57)	41.59 (8.65)	58.41 (8.65)	
1 child	25.24 (5.24)	34.29 (7.96)	65.71 (7.96)	
2+ children	22.58 (4.06)	37.81 (9.03)	62.19 (9.03)	
Health status				0.043*
Good health	61.62 (5.72)	46.99 (8.01)	53.01 (8.01)	
Poor health	38.38 (5.72)	25.92 (5.87)	74.08 (5.87)	
Job characteristics				
Employment status				0.064+
Part time (≤30 hrs.)	19.81 (4.11)	25.42 (6.47)	74.58 (6.47)	
Full time (>30 hrs.)	80.19 (4.11)	43.45 (6.51)	56.55 (6.51)	
Job experience				0.216
≤ 5yrs.	27.30 (4.35)	50.67 (10.06)	49.33 (10.06)	
6+ yrs.	72.70 (4.35)	36.23 (6.25)	63.77 (6.25)	
Time at current job				0.624
≤ 5yrs.	58.49 (5.66)	41.54 (6.72)	58.46 (6.72)	
6+ yrs.	41.51 (5.66)	35.3 (10.18)	64.7 (10.18)	
Jobs in past 5 yrs.				0.922
1 job	40.13 (5.74)	40.71 (8.00)	59.29 (8.00)	
2+ jobs	59.87 (5.74)	39.55 (8.00)	60.45 (8.00)	

Table 4.2 Continued

	All injured HHAs n = 624 % (SE) *f*=100%	Injured with 0 missed days of work[2] n = 310 % (SE) *f*=40.03%	Injured with 1+ missed days of work[2] n = 314 % (SE) *f*=59.97%	P value[1]
Number of current employers				0.955
1 employer	90.66 (2.15)	40.10 (6.13)	59.90 (6.13)	
2+ employers	9.34 (2.15)	39.35 (10.5)	60.65 (10.5)	
Hourly pay rate				0.041*
Low	21.82 (4.71)	29.29 (8.06)	70.71 (8.06)	
Average	31.37 (5.58)	23.18 (5.82)	76.82 (5.82)	
High	46.82 (6.00)	47.65 (8.76)	52.35 (8.76)	
Place of care delivery				0.963
Patient home	64.70 (5.28)	39.91 (7.55)	60.09 (7.55)	
Mixed or in–patient	35.30 (5.28)	40.37 (6.57)	59.63 (6.57)	
Agency characteristics				
Location				0.036*
Urban	83.01 (2.68)	37.89 (6.45)	62.11 (6.45)	
Rural	9.60 (1.94)	39.44 (6.97)	60.56 (6.97)	
Small rural	7.39 (1.44)	65.28 (7.74)	34.72 (7.74)	
Agency type				0.189
Home health	57.51 (5.60)	34.21 (8.57)	65.79 (8.57)	
Hospice	20.79 (3.30)	44.46 (6.41)	55.54 (6.41)	
Mixed	21.70 (4.62)	52.12 (5.87)	47.88 (5.87)	
Ownership status				0.782
For profit	45.49 (6.42)	41.66 (9.31)	58.34 (9.31)	
Not for profit	54.51 (6.42)	38.6 (6.01)	61.40 (6.01)	
Chain affiliation				0.568
Chain	21.78 (4.60)	35.22 (8.30)	64.78 (8.30)	
No chain	78.22 (4.60)	41.35 (6.52)	58.65 (6.52)	

Notes: An unweighted sample of 3,377 and weighted sample of 160,720 HHAs were used in this analysis. All percentages are weighted to reflect the population. Standard errors were calculated to determine the precision of injury estimates. The variables "number of current employers" and "chain affiliation" had to be removed due to insufficient number of observations and relative standard errors (RSE) were >30%.

[1]Significant differences based on $\chi 2$.

[2] Injury severity was only available for HHAs that reported one or more work–related injury n = 624.

+ P<0.15

* P <.05

** P <.01

Data source: NHHAS, 2007.

Table 4.3 Distributions of Types of Injuries Reported By HHAs Across Levels of Severity

	All injuries n = 624	Injured with 0 missed days of work n = 310	Injured with 1+ missed days of work n = 314
	f	*f*	*f*
Type of injury[1]			
Back injuries including pulled back	254	68	186
Other strains/pulled muscles	212	76	136
Animal bites	68	58	10
Black eyes, other bruising	76	48	28
Fall	18	11	7
Needlesticks	18	14	4
Personal injury	16	8	8
Injuries associated with cars	5	2	3
Abuse/assault by patient and/or human bites	25	17	8
Burns and/or wounds	129	93	36
Other injuries	62	22	40

Notes: HHA = home health aides. All frequencies are unweighted.
[1]Among HHAs who reported an injury. Categories are not mutually exclusive because HHAs may be included in multiple categories.
Data source: NHHAS, 2007.

Table 4.4 Types of Injuries and Their Severity Among HHAs in the 2007 NHHAS

Variable	Injured with 0 missed days of work n = 310	Injured with 1+ missed days of work n = 314	P value[1]
	(%)	(%)	
Type of injury[2]			
Back injuries including all strains	26.90 (6.80)	73.10 (6.80)	<0.001*
Other injuries	50.90 (7.40)	49.10 (7.40)	<0.001*

Notes: HHA = home health aides. All percentages are weighted to reflect the population. Standard errors were calculated to determine the precision of injury estimates across reported severity. Types of injury were collapsed into two categories to maintain reliability of survey estimates that is based on a sample >59 regardless of relative standard error.
[1]Significant differences based on $\chi 2$ (+ P<0.15, * P <.05, ** P <.01).
[2]Among HHAs who reported an injury. Categories are mutually exclusive.

Table 4.5 HHAs Injury Patterns Across Place of Care Delivery in the 2007 NHHAS

	Patient homes n = 2,177 % (SE)	Mixed n = 1,198 % (SE)	P value[1]
HHA injury patterns			
Work injury			<0.001**
Not injured	90.94 (1.39)	79.04 (3.01)	
1+ injury	9.06 (1.39)	20.96 (3.01)	
Injury severity[2]			0.9631
0 missed days of work	39.91 (7.55)	40.37 (6.57)	
1+ missed days of work	60.09 (7.55)	59.63 (6.57)	
Type of injury			
Back injuries, strains			0.04*
Yes	7.84 (1.43)	13.89 (2.84)	
No	92.16 (1.43)	86.11 (2.84)	
Other injuries			<0.001**
Yes	1.62 (0.34)	8.27 (1.57)	
No	98.38 (0.34)	91.73 (1.57)	

Notes: All percentages are weighted to reflect the population. Mixed place of care delivery including HHA who provided care in 1 or more inpatient facilities. Types of injury were collapsed into two categories to maintain reliability of survey estimates that is based on a sample >59 regardless of relative standard error. Categories are mutually exclusive.
[1]Significant differences based on $\chi 2$ (+ P<0.15, * P <.05, ** P <.01).
[2]Includes only HHAs who reported injuries.

Table 4.6 Assessment of Individual Training Topics By Injured HHAs

	HHAs rating of training topics					
	Poor/Fair		Good		Excellent	
	(%)	SE	(%)	SE	(%)	SE
Training topics						
Perform patient care skills	13.80	1.75	35.48	2.23	50.72	2.50
Talk with patients	14.80	2.08	37.53	2.70	47.67	2.63
Discuss care with family members	14.87	2.06	36.36	1.94	48.76	2.22
Organize work tasks	15.88	2.07	35.02	2.26	49.11	2.57
Dementia care	15.36	1.90	33.65	2.39	50.99	2.70
Work with abusive patients	16.51	2.20	33.91	2.35	49.58	2.70
Prevent work injuries	15.29	1.92	36.45	2.75	48.26	2.82
Assist with non-patient related duties	15.49	2.54	34.43	2.50	50.07	2.52
End of life issues and grief	14.25	1.83	34.31	2.04	51.44	2.21
Abuse and neglect issues	11.77	1.80	34.56	2.96	53.68	2.94
Relate to patients of different cultures	16.47	2.20	33.30	2.24	50.23	2.41

Notes: All percentages are weighted to reflect the population.
Data source: NHHAS, 2007.

Table 4.7 HHAs Perceived Training and Work Injury Patterns

	Training scale		P value[1]
	Good training n = 2,644	Poor training n = 722	
	% (SE)	% (SE)	
HHA injury patterns			
Work injury			0.909
Not injured	76.45 (2.66)	23.55 (2.66)	
1+ injury	75.84 (4.62)	24.16 (4.62)	
Injury severity[2]			0.713
0 missed days of work	78.39 (5.88)	21.61 (5.88)	
1+ missed days of work	75.73 (5.71)	24.27 (5.71)	
Type of injury[3]			
Back injuries, strains			0.774
Yes	74.62 (5.86)	25.38 (5.86)	
No	76.45 (2.66)	23.55 (2.66)	
Other injuries			0.324
Yes	81.44 (4.32)	18.56 (4.32)	
No	76.22 (2.62)	23.78 (2.62)	

Notes: All percentages are weighted to reflect the population. Standard errors were calculated to determine the precision of injury estimates. Training was coded with the top 3 quartiles as 0 for good training and the bottom quartile as 1 for poor training.

[1]Significant differences based on $\chi 2$ (+ P<0.15, * P <.05, ** P <.01).

[2]Includes only HHAs who reported injuries.

[3]Among HHAs who reported an Injury. Types of injury were collapsed into two categories to maintain reliability of survey estimates that is based on a sample >59 regardless of relative standard error. Categories are mutually exclusive.

Data source: NHHAS, 2007.

Table 4.8 Effects of Poor Training on Work–Related Injuries and Their Severity, Holding HHA and Agency Characteristics Constant

	Model 1		**Model 2**	
	No injury verses injury n = 3,178		Low severity vs. high severity n = 560	
	OR	95% CI	OR	95% CI
Training knowledge scale				
Good training knowledge	Referent		Referent	
Poor training knowledge	1.092	[0.58–2.05]	1.010	[0.50–2.05]
Demographic characteristics				
Race				
White, non–Hispanic	Referent		Referent	
Non–White	0.448*	[0.23–0.87]	3.470*	[1.28–9.40]
Education				
High school, GED or less	Referent		Referent	
Some college or more	1.589+	[0.95–2.64]	0.265**	[0.12–0.57]
Job characteristics				
Hours worked per week				
< 15 hours	Referent		Referent	
15 hours to < 30 hours	1.606	[0.41–6.23]	0.510	[0.07–3.61]
30 hours to <45 hours	3.358*	[1.06–10.60]	0.612	[0.10–3.60]
45+ hours	3.486+	[0.67–18.12]	0.303	[0.03–2.86]
Number of current employers				
1 employer	Referent		—	—
2+ employers	0.337*	[0.15–0.78]	—	—
Hourly pay rate				
Low	Referent		Referent	
Average	1.674	[0.76–3.68]	1.069	[0.37–3.07]
High	1.661+	[0.90–3.07]	0.274*	[0.08–0.93]

Table 4.8 Continued

	Model 1		Model 2	
	no injury verses injury n = 3,178		Low severity vs. high severity n = 560	
	OR	95% CI	OR	95% CI
Agency characteristics				
Location				
Urban	Referent		Referent	
Rural	1.087	[0.63–1.87]	0.711	[0.25–2.00]
Small rural	1.613+	[0.87–3.00]	0.126**	[0.04–0.41]
Agency type				
Home health	Referent		Referent	
Hospice	1.074	[0.45–2.55]	0.179**	[0.06–0.52]
Mixed	1.300	[0.62–2.74]	0.248**	[0.09–0.71]
Ownership Status				
For profit	Referent		Referent	
Not for profit	1.023	[0.50–2.11]	2.915*	[1.07–7.96]

Notes: ORs and 95% CIs are from logistic regression. Best fitting model was examined by Goodness–of–fit test in the binary logistic regression (Archer & Lemeshow, 2006). In Model 2 Number of current employers and Agency ownership type were not included in the model due to reliability issues with appropriate sample size.
+ P<0.15; * P <.05; ** P <.01
Data source: NHHAS, 2007.

CHAPTER 5

MANUSCRIPT 2

Determinants of Occupational Injury: The Relationship Between Environmental and Ergonomic Factors and Home–Based Direct Care Workers Reporting One or More Work–Related Injuries[2]

[2]Hanadi Y. Hamadi, Janice C. Probst, Jessica D. Bellinger, M. Mahmud Khan, Candace N. Porter. To be submitted to *Journal of Aging and Health*.

ABSTRACT

HHAs work in a high–risk industry and experience high rates of work–related injury that have been significantly associated with reduction in worker and organizational productivity, quality and performance, as well as an increase in associated turnover costs. The occupational health and safety literature identified the ergonomic factors and workplace environment are significantly associated with workers' health and wellbeing as well as with the risk for occupational injury. The main objective of the study was to examine how worker environment and ergonomic factors affect home health and hospice aide (HHA) risk for reporting occupational injuries. The study design was a cross–sectional analysis of data from the first National Home Health Aide Survey (NHHAS) conducted by the National Center for Health Statistics in 2007. The study sample consisted of a nationally represented sample of home health aides (n = 3,377) with a 76.6% response rate. Characteristics of the work environment included leadership support, perception of value at work, time pressure organizational culture and whether the HHA were assigned to care for the same patients. The ergonomic scale consisted of the use of lifting devices, consistent availability of devices when needed, and whether other equipment was needed to increase job safety. Univariate and bivariate analysis were conducted to describe HHA work–related injury across individual, job, and organizational factors. To measure scale reliability, Cronbach's alphas were calculated. Multivariable logistic regression was used to determine predictors of reported occupational injury. The adjusted analysis showed that in terms of the environmental scale, poor organizational culture was found to increase the risk for work–related injury by three folds. In terms of the ergonomic scale, the lack of needed devices to perform job

duties safely increased HHAs risk for occupational injury. Having these devices decreased their risk for injury by 30% (95% [CI]: 0.15–0.16). No other work environment or ergonomic scale factors were associated with HHAs' risk of injury. The aging of the baby boomers and the United States population in general has initiated an increased demand for HHAs to serve this continuously growing population. It is common for HHAs to be continuously exposed to multiple occupational hazards and experience incidences of injury above the national average. This study had great implications on a subcategory of the workforce that has a limited amount of published work and studies as of today, as well as an anticipated large demand for them. This issue is a major public health concern since it is projected that this workforce will be in high demand as the United States population continues to grow older and sicker.

INTRODUCTION

Paraprofessional healthcare workers who provide care to individuals with limited to no functional independency and assist in activities of daily living (ADLS) and instrumental activities of daily living (IADLs) are referred to as direct care workers (DCWs). Those who provide these services at the patient's home are home–based DCWs or home health aides (HHAs). In the United States, this group of workers provides fundamental medical services to the ill, elderly, or persons with disability who live in their own homes rather than an institutional setting. Home–based DCWs' job responsibilities include but are not limited to bathing, feeding, changing bandages, and administering medication. They commonly perform tasks that are demanding in an environment that lacks predictability (Behling & Guy, 1993; Markkanen et al., 2007; Meyer & Muntaner, 1999; P. W. Stone et al., 2007).

The transformation of the long–term care (LTC) model to patient care in a non–hospital setting and the aging of the United States population attributed to HHAs being the second–fastest growing sector and is anticipated to be an increasingly needed workforce in the near future (R. I. Stone & Barbarotta, 2010; United States Bureau of Labor Statistics, 2012e). In 2012, approximately 875,100 jobs were held by HHAs, 1,534,400 by nursing assistants and orderlies and 1,190,600 personal care aides in a variety of settings including home, nursing and residential care facilities and hospitals. In the home health services industry, HHAs held 323,000 jobs, nursing assistants and orderlies held 64,300 jobs and personal care aides held 298,600 jobs (United States Bureau of Labor Statistics, 2012c). It is expected that by 2020, approximately 54 million United States individuals will be over 64 and may require home health services from the anticipated 7.7 million home–based DCWs (Brault, 2012; S L Mcginnis & Moore, 2006; United States Bureau of Labor Statistics, 2012e).

HHAs' workplace environment poses multiple factors that are conducive to occupational injury. They perform tasks that are physically, mentally and emotionally demanding in an uncontrolled, unpredictable, high–stress environment while caring for patients who may be uncooperative and difficult to handle (Behling & Guy, 1993; Markkanen et al., 2007; Meyer & Muntaner, 1999; P. W. Stone et al., 2007). Due to shortage in staffing, HHAs often work alone with no direct supervision and minimal to no availability of access to assistance, lifting or other safety equipment (Bell et al., 2013; DiBenedetto, 1995; Markkanen et al., 2007; Seavey, 2004, 2010). The presence of these factors fosters an environment with a high risk for occupational injury (DiBenedetto, 1995; Quinlan & Bohle, 2008).

In this study, a risk factor is defined as any individual organizational or environmental characteristics that place the worker at a higher risk for sustaining an injury or an illness in the workplace and is potentially modifiable (Gropelli & Corle, 2011; Miller, 2013). The types of risk factors that workers are exposed to are determined by where and how the work is performed (Gropelli & Corle, 2011). For example, the most common and well–documented underlying risk factor of work–related injury among healthcare DCWs is related to the manual handling of patients, which leads to musculoskeletal disorders or back–injuries (Czuba et al., 2012; D'Arcy, Sasai, & Stearns, 2012; T. Galinsky et al., 2001; Marras et al., 1999; Miller, 2013; Tullar et al., 2010).

Examining the literature, it is evident that there is a large pool of information and research on occupational injury risk factors of healthcare workers who provide care within an institutional environment (United States Bureau of Labor Statistics, 2012e). However, a limited number of research studies have focused on occupational injury risk factors of HHAs who provide care outside of an institutional environment such as the patient's home. HHAs might experience similar risks to their institutional–bound counterparts because of the similarities in the health status and demographic composition of the patients they serve. However, there are additional risks experienced by HHAs due to the inherited nature of their workplace environment (patient homes). This study examined in depth the worker's: (a) perceived work environment; and (b) ergonomic factors (availability of lifting devices) as predictors for occupational injury.

Occupational Injury Among HHAs

Occupational safety and health continues to be a significant public health problem. Over 4,500 workers each year die and millions of others are injured by

preventable injuries occurring at the workplace across all industries (Sokas, Cloonan, & Braun, 2013). This study defined occupational injury as any physical, mental or emotional injury sustained by a worker at the workplace that occurred during performing job–related responsibilities (Wing et al., 2004). At the workplace, workers are at risk for exposure to hazards and occupational accidents that may lead to injury or illness. The likelihood of sustaining an occupational injury is impacted by what is present at the workplace from environmental to structural factors (Clarke, Rockett, et al., 2002; Clarke, Sloane, et al., 2002a, 2002b). Occupational accidents may cause injury and have been linked to two main components: (a) characteristics of the work and the workplace environment; and (b) characteristics of the individual (Christian, Bradley, Wallace, & Burke, 2009; Iverson & Erwin, 1997; Zacharatos, Barling, & Iverson, 2005).

In the home healthcare service sector, many DCWs experience potentially preventable nonfatal injuries. These injuries result in a significant reduction in worker and organization productivity and performance (Hayes et al., 2006; P. W. Stone et al., 2007). In recent years, strong evidence has shown that occupational injury and illness prevention programs have not been successful in home health since HHAs continue to experience above–average rates of injury at 158.8 per 10,000 full time employees, and are ranked the second–highest occupation for work–related injuries (R. Gershon et al., 2007; Leff et al., 2000; United States Bureau of Labor Statistics, 2012b, 2012c, 2012e). Approximately 57% of all injuries sustained by professional and paraprofessional DCWs occurred during the care of a patient, which is a HHA's primary responsibility. However, there is an alarming frequency (between 25%–50%) of unreported injuries among home–based DCWs (R. Gershon et al., 2007; United States Bureau of Labor Statistics, 2012b).

Workplace Environment Risk Factors

In conjunction with worker training, workplace environment characteristics have been shown to impact HHAs' risk for occupational injury. Such characteristics include work design, supervision, time pressures, and organizational culture. Work design such as shift assignment has been associated with HHAs' risk for occupational injury. Examining the nursing literature, nurses who worked night shifts and more than 12–hour shifts per week were at a higher risk for injury than their counterparts. Furthermore, even with training and use of safety/protective devices, work design remained a significant contributor to the occurrence of injury and illness in HHAs (Jack K Leiss et al., 2009). While exploring the home–based DCW literature, time pressure has repetitively appeared as a significant factor in the risk and predictability of occupational injury (Robyn RM Gershon et al., 2009; R. R. Gershon et al., 2007; Trinkoff et al., 2007).

Ergonomic Risk Factors

Although ergonomic issues are relevant to everyone across different industries and occupations, several of these issues are exacerbated for HHAs because of the setting. The home environment provides a challenge to paraprofessionals due to its continued variability and that it is not specifically designed for care delivery. Despite necessary patient handling by lifting, pushing and pulling performed by healthcare paraprofessionals and professionals, in the home environment they have less assistance and will require the use of ergonomically designed equipment that is often not unavailable (Czuba et al., 2012; Traci Galinsky et al., 2013). Formal caregivers who provide services related to activities of daily living have been identified as having a high rate of musculoskeletal injuries (T. Galinsky et al., 2001). Education and training HHAs

about body mechanics has not shown strong evidence in the prevention of work–related injuries; however, altering physical demands through the use and continuous availability of assistive devices has consistently shown strong evidence in the reduction of occupational injury, psychosocial hazards and patient injury (Beltrami et al., 2000; Jack K Leiss et al., 2011; Owen, 2000). Factors such as lack of required assistive devices, inconsistent availability of safety devices and improper safety devices affect HHA patient moving and handling practices (Johnsson et al., 2002; Marras et al., 1999; A. L. Nelson et al., 2007).

RESEARCH QUESTIONS

The large gap in the HHAs literature, anticipated growth of this workforce and continuously high injury rates indicate a need to explore the underlining causes and potential predictors of injury to develop effective approaches to prevention. The literature showed a few studies with inconsistent findings that explored the impact of environmental factors, training and ergonomic principles in preventing DCW–related injury (Traci Galinsky et al., 2013; D. Lee, 2012; Leff et al., 2000). Studies that specifically examined risk factor elements such as the presence of lifting devices organizational culture, leadership style and time pressures are even more scarce and inconsistencies continue to be present (Craib et al., 2007; McCaughey et al., 2012). Furthermore, no study has examined the potential associations between home–based DCWs' perceived environment and ergonomic work factors on the risk of nonfatal worker–related injuries and their severity among HHAs.

The purpose of this study was to explore the relationship between environmental and ergonomic factors with reported work–related injury among a nationally representative sample HHAs. The research questions for this study were:

1) What is the relationship between workplace environment (measured by workers' perceptions of leadership style, work design and organizational culture) and the probability of reporting one or more work–related injuries?

2) What is the relationship between ergonomic workplace factors and the probability of reporting one or more work–related injuries?

We hypothesized that: (a) workplace conditions such as leadership support, work value, work design, time pressure and organizational culture; and (b) ergonomic factors such as availability and consistent availability of devices, would be associated with reporting work–related injuries.

METHODS

This study used a secondary cross–sectional design to analyze the 2007 United States National Home Health Aide Survey (NHHAS), representing over 15,000 agencies and 160,700 HHAs, to examine relationships between reported work–related injury (a) environmental and (b) ergonomic workplace factors using sample weighted multivariable logistic regression.

Study Design and Population

The 2007 NHHAS was developed by the Centers for Disease Control and Prevention's (CDC) National Center for Health Statistics (NCHS) between August 2007 and February 2008 as a secondary survey of the 2007 National Home and Hospice care survey (NHHCS). The sampling frame of 15,488 agencies was developed through three data sources: (a) the Centers for Medicare and Medicaid Services Providers of Services file of home health agencies and hospice; (b) state licensing lists of home health agencies

of private organizations; and (c) the National Hospice and Palliative Care Organization file of hospices. The NHHAS was fielded to HHAs at a nationally represented subset of agencies (n = 3,377) participating in the 2007 NHHCS (n = 955). Up to six HHAs were randomly chosen in all participating agencies. An average of 4.3 aides were sampled per agency with a response rate of 72% (Bercovitz et al., 2011). To gather nationally representative baseline descriptive statistics about HHAs, the survey instrument asked HHAs to provide information about a wide variety of work–related and demographic factors including occupational injury, training, recruitment, workplace environment and demographic characteristics (Bercovitz et al., 2011). The research for the results presented here was reviewed and categorized as "exempt" by the Institutional Review Board of the University of South Carolina since the study analyzed secondary data.

Variable

Dependent Variables

The dependent variable was work–related injury. Respondents were asked to indicate the number of injuries during the 12–month period prior to the survey interview date, which were: (a) reported to the agency; (b) required medical attention; or (c) caused missed workdays (Bercovitz et al., 2010). The variables were operationalized where inapplicable/not ascertained equates to not being injured (zero incidents of injury) and reporting one or more incidents of injury equates to being injured (McCaughey et al., 2012).

Independent Variables

HHAs' perception of the work environment was measured across five areas: leadership style, work design, time pressures, work values, and organizational culture.

Leadership style was measured as a scale of four survey items that focused on supervisor behavior. The internal consistency reliability estimate for the leadership scale was Cronbach's alpha $\alpha = 0.80$. Work design was not a scale and was measured by one survey item that asked all HHAs to indicate their patient assignments as either having a) same patients, b) patient change or c) combination (Burgio et al., 2004; Rahman et al., 2009). Time pressure was measured by two survey items on a 3–point scale to assess whether they have enough time to provide individual attention to their patients and to complete other duties that do not directly involve patient handling. The internal consistency reliability estimate for this scale was Cronbach's alpha $\alpha = 0.68$, slightly below the recommended $\alpha = 0.70$; however, it is still within the acceptable range (Black & Porter, 1996; Nunnally, 1978).Two survey items using a 3–point scale measured the work value scale. The questions asked HHAs whether they perceived that their supervisors and organizations valued them. The internal consistency reliability estimate for this scale was Cronbach's alpha $\alpha = 0.66$ slightly below the recommended $\alpha = 0.70$; however, it is still within the acceptable range (Black & Porter, 1996; Nunnally, 1978). Organizational culture was measured by eight survey items answered using a four–point scale with Cronbach's alpha $\alpha = 0.74$. The eight survey items focused on the HHA's perception of being respected, challenged, trusted, and confident, satisfied and whether they would recommend the job and the agency. All scale scores used for the analysis were dichotomized as scores ranked in the bottom 25 percentile for poor/low and scores in the top 75 percentile for good/high. All scores identified as poor were below the average item value for each series.

Ergonomic workplace factors were operationalized by measuring the use of lifting devices, the presence of lifting devices and the need for other equipment. Use of a lifting device was a dichotomous variable measured by one survey item that focused on HHAs' use of lifting devices to assist patient handling. The presence of a lifting device, a dichotomous variable, was measured by HHAs' self–reporting the availability of required lifting devices when needed. The need for other equipment was measured by HHAs' self–reported availability of other needed equipment that is accessible. The HHA reported whether they needed or did not need other equipment to safely perform job duties and responsibilities.

Control variables

Home–based DCW characteristics include race (coded as non–Hispanic White, Black, Hispanic of any race and other), education, age, gender, household income, marital status, number of children in household ≤ the age of 17, place of care delivery (coded as home health, hospice and mixed), hourly pay rate, job experience, health status, employment status, time at current job, number of jobs in the last five years, number of current employers, and primary language (measured to reflect the diversity of the home healthcare direct care workforce and its effect on patient/worker communication).

Last, agency specific variables were used to understand the impact of agency characteristics on occupational injury patterns. In the public version of the 2007 NHHAS, there were a limited number of agency characteristics consisting of agency location (coded as metropolitan, metropolitan or large rural and small rural), type ownership status (not for profit and for profit) and chain affiliation.

Data Analysis

All analysis was conducted using STATA (Version 12.0, STATA Corporation, College Station, Texas, USA) to account for the complex, weighted and clustering structure of the sample design. An alpha (α) level of 0.05 was used to determine statistical significance. Univariate and bivariate analysis using frequencies, percentages, means, median and standard deviations was conducted to describe home–based DCWs work–related injuries across organizational and ergonomic factors. Multivariable logistic regression was used to determine ergonomic factors and workplace environment predictors of worker–reported occupational injury.

RESULTS

Characteristics of the Sample

The socio–demographics, job, and agency characteristics among study participants are described in Table 5.1. Almost all of the HHAs were English–speaking females (95%), the majority worked for home health agencies (74%), and delivered care to patients within their homes (80.96%). Of the 3,377 HHA participants, 60% had a high school degree or less, and almost half (49%) reported a household income of less than $30,000 a year. Most workers (63%) rated their health status as “excellent” or “very good”. Among HHAs’ job characteristics, 60% were employed full time, and 70% had over six years of home health experience. More than half of the workers held one job and had been employed with their agency for less than five years. Among agency characteristics, 63% of the HHAs in the study worked for profit organizations, and 70% worked for agencies that were not affiliated with a chain.

Characteristics of Injured HHAs

The socio–demographic, job, and agency characteristics among study participants, as well as their associations with reported work–related injury, are depicted in Table 5.2. The majority of HHAs (81.5%) did not report injuries during the year prior to the study (not shown). A total of 624 HHAs reported having had at least one injury. Of the socio–demographic characteristics analyzed, race and level of education were found to be significantly associated with HHAs reporting an injury, with a chi–square test of 0.001 and 0.034, respectively. White and college–educated HHAs reported more work–related injuries than non–white and high school educated HHAs.

Among HHAs' job characteristics, employment status, number of current employers, hourly pay rate, and place–of–care delivery were linked to HHAs' rate of work–related injury. First, approximately, 15% of full–time employed HHAs reported an injury, while only 5.5% of part–time employed HHAs reported an injury. Second, HHAs with more than one job reported fewer injuries (4%) than HHAs with one job (14%). Third, HHAs with high or average hourly pay rate reported injuries more than twice as much (14%) as HHAs with low hourly pay rate (6.5%). Fourth, HHAs providing care to patients in mixed or in–patient settings (21%) were found to report more injuries than HHAs working in patient homes (9%).

Among agency characteristics, chi–square test results show that agency type and ownership status were significantly associated with work–related injury. HHAs employed by not for profit agencies that are not affiliated with a chain reported a higher percentage of injuries than HHAs employed by for–profit agencies that are affiliated with a chain.

Work Environment and Ergonomic Scales

The work environment scale construct and HHAs' responses to the scale are presented in Table 5.3. The mean scores of all scale measures were consistently above the median and show a generally favorable work environment. Table 5.4 depicts the distribution of HHAs' responses to the work environment and ergonomic scales, as well as the association of these scales to work injury. Among the work environment scale, organizational culture and work design were found to have an association with work–related injury. HHAs who perceived working in an agency with poor organizational culture (16%) were more likely to be injured than those who indicated that they work in an agency with good organizational culture (9%). Furthermore, HHAs who consistently saw the same patients (10%) had a lower rate of injury than those who did not (17%). Among the ergonomic scale, use of lifting devices and the need for other devices for job safety were significantly associated with work–related injury. Persons who indicated using lifting devices (13%) were more likely to be injured than persons who have not used them (7.6%). As for HHAs who reported the need for other devices to ensure their job safety, they reported more injuries (22%) than those who did not need any additional devices for job safety (9.8%).

HHAs reporting low leadership support and low–perceived work value showed a slightly but not significantly increased proportion of reported work–related injury, and those reporting poor organizational culture showed a statistically significant increase in reported injury. Examining work design, HHAs who were assigned the same patients reported a higher rate of work–related injury (74%) than those working different patients

or a combination of both (26%). The consistent presence of lifting devices was shown not be associated with HHAs work–related injury.

Multivariate Analysis: Effects of Work Environment, and Ergonomic Scales

Generalized logistic regression was used to distinguish the individual and combined effects of work environment and ergonomic scales, and the likelihood of HHAs reporting one or more work–related injuries while holding other characteristics constant. The results of the adjusted weighted logistic regression are described in Table 5.5. In terms of the individual effects of the work environment scale, the risk for work–related injury was increased among HHAs employed in agencies with poor organizational culture (OR = 3.895, 95% confidence interval [CI]: 1.70–8.95). In terms of the individual effects of the ergonomic scale, the need for other devices for job safety increased the risk for work–related injury. HHAs who did not need any additional devices to complete their job safely were 30% less likely to be injured than HHAs who need such devices (95% [CI]: 0.15–0.16). Furthermore, when examining the combined effects of the work environment and ergonomic scale, both poor organizational culture, and the need for devices for job safety continued to be risk factors for increased likelihood of work–related injury among HHAs. No other work environment or ergonomic scale measures were associated with HHAs' risk for injury.

DISCUSSION

This study examined the relationship of work–related injury with both environmental and ergonomic factors. The study used the only nationally representative survey of United States HHAs in order to understand the risk factors associated with reporting work–related injury in this fast growing workforce. The BLS estimates that

HHAs will be the second fastest–growing occupation by 2016 (United States Bureau of Labor Statistics, 2012e). Few studies have examined the effects of the workplace environment and ergonomic factors on workers' risk of injury and even fewer have specifically explored these factors among HHAs (Aiken et al., 2011; Arlinghaus et al., 2013; Hall, Blair, Smith, & Gorski, 2013; McCaughey, 2008; S. Nelson et al., 2011; Restrepo et al., 2013; Rossman, 2011; Wong & Cummings, 2007). This is important because HHAs provide care in patients' homes, which is unique and uncontrollable from a worker and agency perspective. HHAs perform most tasks independently with little to no supervision. Therefore, the findings of this study have great implications on a subcategory of the workforce that has a limited amount of published work and studies as of today, as well as an anticipated large demand for more research.

The first major finding of this study was that a large percent of HHAs are pleased with the multiple components of the work environment. They were satisfied with the leadership support, work value, time pressure, and organizational culture provided to them by their respectful agencies. These findings are consistent with other published studies on certified nursing assistants and other health based studies on direct care workers (Rosen, Stiehl, Mittal, & Leana, 2011; Squillace et al., 2009; Wiener et al., 2009; Yeatts et al., 2010).

Second, HHAs who perceived poor organizational culture were found to have a higher rate of reported work–related injury. When controlling for HHAs socio–demographic, job and agency characteristic, poor organizational culture continued to be a risk factor for occupational injury, but work design's association with work–related injury was no longer significant. These results do not highlight the importance of

leadership support and work value to worker safety and performance, as have been documented by several studies that examined the effects of the work environment on registered nurses (RN) and certified nursing aides (CNAs). One study found that a heavy workload, working overtime, perceived lack of agency and supervisory support and a lack of a supportive culture were critical risk factors for home healthcare worker injuries (Eriksen, 2003). Furthermore, the results of high perceived positive work environment implies that HHAs are satisfied with their jobs.

Third, the use of lifting devices and the consistent availability of lifting when needed were found not to be associated with HHAs reporting one or more work–related injury. However, HHAs who have indicated the need for other safety devices when caring for patients had a higher risk for work–related injuries. This finding highlights the importance of providing the needed devices for HHAs to care for their patients; simply, the availability of devices is not sufficient unless they are appropriate for the care required. Furthermore, non–White HHAs had a lower risk of reporting work–related injuries, which is consistent with the national statistics on injury prevalence in the United States (United States Bureau of Labor Statistics, 2012b). However, it has been documented that race impacts workers' reporting patterns. Some studies acknowledged that non–White workers were less likely to report an injury for job security reasons (De Castro, 2003; R. Gershon et al., 2007; Hamory, 1983).

Finally, HHAs who are employed full time were found to be at a higher risk for reporting work–related injury across the two logistic regression models (environmental scale and ergonomic scale). This can be explained with the concept that full time employees are eligible and more likely receive benefits from the employer agency and

are more likely to report an injury to receive appropriate compensation (Institute for the Future of Aging Services, 2007; Montgomery et al., 2005; United States Occupational Safety, 1992). Surprisingly, work–related injury was not linked to a worker's health status, which is contradictory to what the literature indicated (De Castro et al., 2010; Eriksen, 2003; Hansen, 1989; Scalia, 2001; Smedley et al., 2003).

There are a couple of policy implications that can be derived from the study's findings. First, even with the small proportion of injuries reported by HHAs in the study, this issue is a major public health concern since it is projected that this workforce will be in high demand as the United States population continues to grow older and sicker (R. I. Stone & Barbarotta, 2010; R. I. Stone & Wiener, 2001). Second, overall work–related injuries in the healthcare system have cost burdens and lead to poor patient, worker, and agency outcomes (Lahiri, Levenstein, Nelson, & Rosenberg, 2005; Seavey, 2004; Waehrer, Leigh, & Miller, 2005).

LIMITATIONS

Several limitations within this study impact the reported findings. The study is unable to make causal inferences due to the use of a cross–sectional design of secondary data. The use of a longitudinal design is recommended for future research in order to strengthen the linkages found in this study and the causes of work–related injury with the identification of environmental and ergonomic risk factors. The outcome measure, work–related injury, was limited to only injuries reported by HHAs to their agencies and injuries that required medical attention. Furthermore, the sample size of HHAs who reported an injury limits the studies' results. The high rate of underreporting within this specific workforce hinders the ability to generalize the findings of this study. Some

studies have provided rationales for the high amount of underreporting. Some suggest that HHAs are inclined to not follow reporting procedures because they typically work alone with little to no supervision (Kendra, 2002; Weddle, 1996). Other studies suggest that HHAs and other DCWs perceive injuries to be part of the job or believe that minor injuries do not need to be reported (R. Gershon et al., 2007; A. L. Nelson et al., 2007).

In the agencies sample, HHAs identified were from all Medicare–certified agencies, and post–survey adjustment was limited in correcting for the differences between agency certification status. The certification process requires agencies to follow an additional set of guidelines that can affect the workflow for the HHAs (Ahrens, 2005). Therefore, the applicability of these findings is limited to HHAs who are employed in Medicare–certified agencies.

The survey instrument used was not designed to explore work–related injury, its causation or its process. This limited the ability of the study to identify the risk factors associated with risk injury; this only allowed for the development of association between some risk factors and the likelihood of reporting an injury. The survey relied on self–reporting and recall, which increases potential response biases of the information provided. The work environment scale was based on HHAs' perception of their environments and did not include measures of the reasons for perceived work environment. The survey also did not collect information on other workplace climate measures from different perspectives, which hampers the generalizability of the study.

Future research is needed for this under studied workforce population, specifically to examine and determine the risk factors for occupational injuries. As such, injury prevention programs may be developed to target the foundational reasoning and

modifiable behaviors associated with the risks for work–related injury. It is especially important to do so for the HHA population due to all of the changes in consumer preferences and political environments, as well as the push for more home– and community–based programs.

Table 5.1 Socio–Demographic, Job, and Agency Characteristics of HHAs

	All HHAs n = 3,377
	% (SE)
Socio-demographic characteristics	
Age	
≤44 y/o	43.54 (2.50)
45+ y/o	56.46 (2.50)
Race	
White, non–Hispanic	50.95 (3.29)
Non–White	49.05 (3.29)
Marital status	
Married	50.97 (2.60)
Not married	49.03 (2.60)
Education	
High school, GED or less	59.89 (2.18)
Some college or more	40.11 (2.18)
Household income (US$)	
Less than 30K	49.47 (2.54)
30k–50k	32.98 (2.19)
Above 50K	17.55 (1.88)
Children in household	
0 children	52.09 (2.15)
1 child	20.45 (1.71)
2+ children	27.47 (2.11)
Health status	
Good health	63.30 (2.32)
Poor health	36.70 (2.32)
Job characteristics	
Employment status	
Part time (≤30 hrs.)	40.53 (2.49)
Full time (>30 hrs.)	59.47 (2.49)
Job experience	
≤ 5yrs.	29.58 (2.20)
6+ yrs.	70.42 (2.20)
Time at current Job	
≤ 5yrs.	63.10 (3.18)
6+ yrs.	36.90 (3.18)
Jobs in past 5 yrs.	
1 job	31.51 (2.88)
2+ jobs	68.49 (2.88)

Table 5.1 Continued

	HHAs n = 3,377
	% (SE)
Number of current employers	
1 employer	73.00 (2.41)
2+ employers	27.00 (2.41)
Hourly pay rate	
Low	37.71 (4.34)
Average	25.11 (2.89)
High	37.18 (3.85)
Place of care delivery	
Patient home	80.96 (1.88)
Mixed or in–patient	19.04 (1.88)
Agency characteristics	
Location	
Urban	84.02 (1.72)
Rural	10.40 (1.40)
Small rural	5.58 (0.85)
Agency type	
Home health	74.19 (2.62)
Hospice	12.44 (1.25)
Mixed	13.37 (2.16)
Ownership status	
For profit	63.28 (4.09)
Not for profit	36.72 (4.09)
Chain affiliation	
Chain	29.95 (4.01)
No chain	70.05 (4.01)

Notes: An unweighted sample of 3,377 and weighted sample of 160,720 HHAs were used in this analysis. All percentages are weighted to reflect the population. Standard errors were calculated to determine the precision of injury estimates.
Data source: NHHAS, 2007.

Table 5.2 Socio–Demographic, Job and Agency Characteristics of Injury HHAs

	Not injured n = 2,751	Injured n = 624	P value[1]
	% (SE)	% (SE)	
Socio-demographic characteristics			
Age			0.352
≤44 y/o	89.83 (1.61)	10.17 (1.61)	
45+ y/o	87.77 (1.78)	12.23 (1.78)	
Race			0.001**
White, non–Hispanic	83.94 (2.19)	16.06 (2.19)	
Non–White	93.16 (1.43)	6.84 (1.43)	
Marital status			0.919
Married	88.64 (1.72)	11.36 (1.72)	
Not married	88.37 (2.01)	11.63 (2.01)	
Education			0.034*
High school, GED or less	90.60 (1.32)	9.40 (1.32)	
Some college or more	85.41 (2.38)	14.59 (2.38)	
Household income (US$)			0.474
Less than 30K	89.87 (1.60)	10.13 (1.60)	
30k–50k	86.45 (2.82)	13.55 (2.82)	
Above 50K	87.41 (2.91)	12.59 (2.91)	
Children in household			0.401
0 children	88.48 (1.84)	11.52 (1.84)	
1 child	85.81 (3.11)	14.19 (3.11)	
2+ children	90.55 (1.97)	9.45 (1.97)	
Health status			0.743
Good health	88.82 (1.72)	11.18 (1.72)	
Poor health	87.98 (1.92)	12.02 (1.92)	
Job characteristics			
Employment status			<0.001**
Part time (≤30 hrs.)	94.47 (1.28)	5.53 (1.28)	
Full time (>30 hrs.)	84.7 (2.03)	15.3 (2.03)	
Job experience			0.573
≤ 5yrs.	89.56 (2.03)	10.44 (2.03)	
6+ yrs.	88.29 (1.46)	11.71 (1.46)	
Time at current Job			0.416
≤ 5yrs.	89.16 (1.54)	10.84 (1.54)	
6+ yrs.	86.84 (2.49)	13.16 (2.49)	
Jobs in past 5 yrs.			0.11+
1 job	85.48 (2.58)	14.52 (2.58)	
2+ jobs	90.11 (1.52)	9.89 (1.52)	
Number of current employers			<0.001**
1 employer	85.91 (1.67)	14.09 (1.67)	
2+ employers	96.09 (1.00)	3.91 (1.00)	

Table 5.2 Continued

	Not injured n = 2,751 % (SE)	Injured n = 624 % (SE)	P value[1]
Hourly pay rate			0.015*
Low	93.43 (1.52)	6.57 (1.52)	
Average	85.82 (3.09)	14.18 (3.09)	
High	85.71 (2.29)	14.29 (2.29)	
Place of care delivery			<0.001**
Patient home	90.94 (1.39)	9.06 (1.39)	
Mixed or in–patient	79.04 (3.01)	20.96 (3.01)	
Agency characteristics			
Location			0.436
Urban	88.8 (1.52)	11.2 (1.52)	
Rural	89.56 (1.92)	10.44 (1.92)	
Small rural	85.02 (2.85)	14.98 (2.85)	
Agency type			<0.001**
Home health	91.21 (1.56)	8.79 (1.56)	
Hospice	81.09 (2.16)	18.91 (2.16)	
Mixed	81.65 (3.35)	18.35 (3.35)	
Ownership status			0.001**
For profit	91.84 (1.47)	8.16 (1.47)	
Not for profit	83.21 (2.34)	16.79 (2.34)	
Chain affiliation			0.093+
Chain	91.78 (1.84)	8.22 (1.84)	
No chain	87.33 (1.68)	12.67 (1.68)	

Notes: An unweight sample of 3,377 and weighted sample of 160,720 HHAs were used in this analysis. All percentages are weighted to reflect the population. Standard errors were calculated to determine the precision of injury estimates.
[1]Significant differences based on $\chi 2$.
+ P<0.15
* P <.05
** P <.01
Data source: NHHAS, 2007.

Table 5.3 Mean Response to Work Environment Scales in the 2007 NHHAS

	f	Mean (SE)	Number of items	Min–Max Likert score	Cronbach's alpha
Work environmental scale:					
Leadership	3,315	3.17 (0.06)	4	1–4	0.80
Work value	3,334	2.51 (0.04)	2	1–3	0.66
Time pressure	3,011	2.00 (0.04)	2	1–3	0.68
Organizational culture	3,299	2.85 (0.04)	8	1–4	0.74

Notes: All means are weighted to reflect the population.

Table 5.4 Distribution of HHAs' Responses to the Work Environmental and Ergonomic Scales in the 2007 NHHAS

	All HHAs n = 3,377	Not injured n = 2,751	Injured n = 624	P value[1]
	% (SE)	% (SE)	% (SE)	
Work environmental scale:				
Leadership				0.065+
High leadership support	67.30 (2.34)	90.46 (1.37)	9.54 (1.37)	
Low leadership support	32.70 (2.34)	84.55 (3.15)	15.45 (3.15)	
Work value				0.052+
High perceived work value	63.64 (2.46)	90.43 (1.48)	9.57 (1.48)	
Low perceived work value	36.36 (2.46)	84.91 (2.59)	15.09 (2.59)	
Time pressure				0.408
Low time pressure	45.50 (2.45)	86.82 (2.21)	13.18 (2.21)	
High time pressure	54.50 (2.45)	89.15 (1.72)	10.85 (1.72)	
Organizational culture				0.012*
Good culture	61.65 (2.57)	91.18 (1.3)	8.82 (1.3)	
Poor culture	38.35 (2.57)	83.79 (2.96)	16.21 (2.96)	
Work design				0.034*
Same patient	82.58 (1.80)	89.65 (1.33)	10.35 (1.33)	
Patient change or both	17.42 (1.80)	82.79 (3.57)	17.21 (3.57)	
Work ergonomic scale:				
Use of lifting devices				0.053*
Yes	70.65 (2.99)	86.88 (1.64)	13.12 (1.64)	
No	29.35 (2.99)	92.43 (2.01)	7.57 (2.01)	
Consistent presence of lifting devices				0.668
Yes	48.06 (2.65)	88.91 (1.84)	11.09 (1.84)	
No	51.94 (2.65)	87.75 (1.98)	12.25 (1.98)	
Need other devices for job safety				0.004**
Yes	14.34 (1.74)	78.06 (5.16)	21.94 (5.16)	
No	85.66 (1.74)	90.24 (1.29)	9.76 (1.29)	

Notes: An unweighted sample of 3,377 and weighted sample of 160,720 HHAs were used in this analysis. All percentages are weighted to reflect the population. Standard errors were calculated to determine the precision of injury estimates.

[1]Significant differences based on $\chi 2$.

+ P<0.15

* P <.05

** P <.01

Table 5.5 Effects of the Environmental and Ergonomic Scale on Injury, Holding HHA, Job and Agency Characteristics Constant

	Work environment scale n = 3,334		Work ergonomic scale n = 3,334		Both scales n = 3,334	
	OR	95% CI	OR	95% CI	OR	95% CI
Work environmental scale:						
Leadership						
High leadership support	Referent	Referent	—	—	Referent	Referent
Low leadership support	1.084	[0.54–2.19]	—	—	1.133	[0.59–2.19]
Work value						
High perceived work value	Referent	Referent	—	—	Referent	Referent
Low perceived work value	1.028	[0.49–2.17]	—	—	0.701	[0.35–1.38]
Time pressure						
Low time pressure	Referent	Referent	—	—	Referent	Referent
High time pressure	0.628+	[0.38–1.03]	—	—	0.658+	[0.40–1.07]
Organizational culture						
Good culture	Referent	Referent	—	—	Referent	Referent
Poor culture	3.895**	[1.70–8.95]	—	—	4.307**	[1.93–9.61]
Work design						
Same patient	Referent	Referent	—	—	Referent	Referent
Patient change or combination	0.962	[0.53–1.73]	—	—	1.045	[0.57–1.91]
Work Ergonomic Scale:						
Use of lifting devices						
Yes	—	—	Referent	Referent	Referent	Referent
No	—	—	1.021	[0.49–2.15]	0.906	[0.41–1.99]
Consistent presence of lifting devices						
Yes	—	—	Referent	Referent	Referent	Referent
No	—	—	1.443	[0.83–2.51]	1.233	[0.73–2.07]
Need other devices for job safety						
Yes	—	—	Referent	Referent	Referent	Referent
No	—	—	0.301**	[0.15–0.61]	0.303**	[0.16–0.58]

Table 5.5 Continued

	Work environment scale n = 3,334		Work ergonomic scale n = 3,334		Both scales n = 3,334	
	OR	95% CI	OR	95% CI	OR	95% CI
Demographic characteristics						
Race						
White– non–Hispanic	Referent	Referent	Referent	Referent	Referent	Referent
Non–White	0.441*	[0.22–0.89]	0.430*	[0.21–0.86]	0.444*	[0.21–0.92]
Job characteristics						
Employment status						
Part time (≤30 hrs.)	Referent	Referent	Referent	Referent	Referent	Referent
Full time (>30 hrs.)	3.043**	[1.42–6.52]	2.391*	[1.11–5.15]	2.908**	[1.34–6.29]
Number of current employers						
1 employer	Referent	Referent	Referent	Referent	Referent	Referent
2+ employers	0.272**	[0.12–0.63]	0.289**	[0.12–0.70]	0.283**	[0.12–0.66]
Hourly pay rate						
Low	Referent	Referent	Referent	Referent	Referent	Referent
Average	1.446	[0.65–3.22]	1.889+	[0.87–4.08]	1.623	[0.72–3.67]
High	1.798+	[0.89–3.64]	1.816*	[1.02–3.24]	1.873+	[0.96–3.66]
Place of care delivery						
Patient home	Referent	Referent	Referent	Referent	Referent	Referent
Mixed or in–patient	3.090**	[1.40–6.82]	2.045+	[0.92–4.54]	2.735*	[1.23–6.07]
Agency characteristics						
Location						
Urban	Referent	Referent	Referent	Referent	Referent	Referent
Rural	1.289	[0.72–2.31]	1.128	[0.64–2.00]	1.307	[0.70–2.46]
Small rural	2.067*	[1.06–4.01]	1.613+	[0.84–3.08]	2.021+	[0.99–4.14]

Notes: ORs and 95% CIs are from logistic regression. All three models controlled for other demographic, job, and agency characteristics but were not significant and are not presented in the table. + P<0.15; * P <.05; ** P <.01
Data source: NHHAS, 2007.

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APPENDIX A – FOCUS GROUP QUESTIONS INSTITUTIONAL REVIEW BOARD EXEMPTION

OFFICE OF RESEARCH COMPLIANCE

April 11, 2014

Mr. Hanadi Hamadi
Arnold School of Public Health
Health Services Policy and Management
800 Sumter Street
Columbia, SC 29208

Re: **Pro00033974**
Study Title: *Analysis of Risk Factors Contributing to Home-Based Direct Care Worker (DCW) Occupational Injury in Long-Term Care*

Dear Mr. Hamadi:

The Office of Research Compliance, an administrative office that supports the University of South Carolina Institutional Review Board (USC IRB), reviewed the referenced study on behalf of the USC IRB, and determined that the proposed activity is exempt from the Protection of Human Subjects Regulations (45 CFR 46.102).

No further oversight by the IRB is required; however, the investigator should inform this office prior to making any substantive changes to the study, as this may alter the exempt status of the study.

If you have questions, please contact Arlene McWhorter at arlenem@sc.edu or (803) 777-7095.

Sincerely,

Lisa M. Johnson
IRB Manager