

CRITICAL CARE REGISTERED NURSE TRANSITIONS:
A LIFE COURSE PERSPECTIVE

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ABSTRACT

Alberta K. Tran: Critical Care Registered Nurse Transitions,
A Life Course Perspective
(Under the direction of Cheryl Jones)

Sufficient numbers of critical care registered nurses (CC RNs) are necessary to provide care to and improve the outcomes of critically ill patients. Unfortunately, there are challenges in maintaining a sufficient CC RN workforce, such as the fast-paced and stressful nature of the critical care (CC) environment and employers' desire to hire experienced nurses. Little is known about nurse transitions, in general, or CC RN transitions out of the CC specialty, and the factors that influence these transitions. This dissertation addressed this knowledge gap by using life course theory (LCT) from sociology to identify factors that predict the occurrence and timing of nurse transitions out of the CC RN workforce.

Individual RN licensure data from the North Carolina Board of Nursing over a 13-year period were linked at two-year intervals to create a longitudinal dataset of responses for CC RNs. Descriptive statistics, Poisson regression, logistic regression, and ordinal regression were used to examine the effects of LCT variables (e.g., economic recession, graduation cohort, age, and gender) on the occurrence and timing of CC RN transitions. This study found that, despite the relatively short observation period, the majority of CC RNs made transitions to either a non-CC specialty or inactive/non-licensed status. Working during the Great Recession (2007-2009) decreased the odds of RN transition but, for those nurses who made transitions, the odds of remaining in CC for longer times decreased. Additionally, this study found that age and gender had different effects on transition outcomes: male CC RNs were less likely to leave CC for a

non-CC specialty but more likely to become inactive/non-licensed; CC RNs who were between 30 and 49 years old, relative to those 29 or younger, were less likely to transition to inactive/non-licensure status but age had no effect on transition to non-CC specialty areas.

This dissertation underscores the importance of differentiating types of nurse transitions and examining nurses' work behaviors within broader environmental contexts. Findings can help guide the development of stronger policies and employer-based strategies to bolster workforce capacity and aid in workforce planning efforts during times of need in the immediate and long-term future.

To the defining moments forced upon us in 2020,
and their many opportunities for growth.

For my father.

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This dissertation is the product of an evolving journey that occurred throughout a series of transitions within my own larger life course. Amid a global pandemic, national crises, and profound personal loss, it feels impossible to summarize the thoughts that are associated with the completion of this research and degree, but I want to take the opportunity to express my gratitude for those who I hope already know how much their support has meant to me and to offer some perspective for the people who may one day be reading this.

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LIST OF ABBREVIATIONS

AACN	American Association of Critical Care Nurses
ACA	Affordable Care Act
ADN	Associate degree in nursing
BSN	Bachelor of science in nursing
CC	Critical care
CC RN	Critical care registered nurse
Gen X	Generation X
HPDS-RN	Health Professions Data System - Registered Nurses
IOM	Institute of Medicine
ICU	Intensive care unit
LCT	Life course theory
LPN	Licensed practical nurse
MSN	Master of science in nursing
NC	North Carolina
NCBON	North Carolina Board of Nursing
NCHPDS	North Carolina Health Professions Data System
NCSBN	National Council of State Boards of Nursing
NSSRN	National Sample Survey of Registered Nurses
RN	Registered nurse
SCCM	Society of Critical Care Medicine
UNC	University of North Carolina
U.S.	United States

CHAPTER 1. INTRODUCTION

A skilled registered nurse (RN) workforce is essential to provide quality care to acutely ill patients and improve patient and organizational outcomes. In the United States (U.S.), critical care RNs (CC RNs) – or licensed RNs with entry-level nursing education, plus specialized training and certifications – provide care to critically ill patients with life-threatening conditions and at high risk for morbidities or mortality (Robertson & Al-Haddad, 2013). The specialized training gives CC RNs a unique skill set to care for this population of patients, allowing RNs to provide advanced treatments, conduct specific patient assessments, and manage complex technologies. These skills prepare RNs to work on intensive care units (ICUs), step-down units, progressive care and telemetry units, emergency departments, air and ground transportation, and post-surgery recovery rooms to care for patients with intensive and unique care needs (American Association of Critical Care Nurses [AACN], 2003; Robnett, 2006).

Organizations rely on sufficient numbers of CC RNs to provide direct care to and improve the outcomes of critically ill patients (Kane et al., 2007; McGahan, Kucharski, & Coyer, 2012; Penoyer, 2010). Organizations, the discipline, and health care, in general, also rely on CC RNs to respond to urgent care demands, mentor, consult with, and support current and future clinicians, researchers, and leaders in these specialty areas. The dependence on CC RNs has never been more obvious than during the coronavirus disease (COVID-19) global pandemic of 2020, when high numbers of COVID-19 patients sharply increased the demand for ventilators, ICU beds, and CC. Unfortunately, CC specialty areas have consistently faced challenges in maintaining sufficient numbers of RNs (Cleary, Lacey, & Beck-Warden, 1998; Nursing

Solutions Incorporation¹ [NSI], 2017; NSI, 2016; Spetz, 2018). The stressful nature of the work, the fast-paced environment, and the demand to hire experienced RNs (rather than newly licensed ones) make overcoming this challenge difficult (Buerhaus, Staiger, & Auerbach, 2000; Kovner et al., 2014; Mealer et al., 2012; Merlani et al., 2011; Poncet et al., 2007).

In a recent survey of over 8,000 CC RNs, a third of all CC RN respondents expressed the intent to leave their current position in the next 12 months (Ulrich et al., 2019). Research on the CC RN workforce has typically focused on burnout (Chuang et al., 2016; Epp, 2016; Pereira et al., 2016), job satisfaction (Dillig-Ruiz et al., 2018), and attrition (i.e., the departure of CC RNs from active practice and/or the nursing workforce) (Khan et al., 2019), all factors that alone or in some combination may influence CC RN retention and intent to leave. Because the CC RN workforce is prepared with general, “core” nursing skills in their entry-level education, and advanced skills in their CC specialty training, these RNs are especially attractive to employers outside of CC, to manage patients in a range of clinical settings and specialties (American Association of Colleges of Nursing, 2008a). Thus, by virtue of their backgrounds and experiences, CC RNs can “transition” out of a CC-related specialty and into other CC and non-CC settings with relative ease, and often without obtaining additional formal education throughout their careers.

Little is known about CC RN transitions out of the specialty, or RN transitions in general, out of the many and varied other specialty areas available to nurses today. Nurse workforce research focusing on CC RN specialty transitions is essential to understand how the movement of actively practicing nurses out of the specialty might affect the larger RN workforce and its

¹The NSI is a national high-volume nurse recruitment and retention firm that recruits experienced RNs as employees for organizations.

capacity to address specific population healthcare needs. Thus, this dissertation examined CC RN transitions out of the specialty by: 1) describing the CC RN workforce and the types of specialty transitions made by CC RNs; 2) estimating the likelihood of CC RN transition out of CC and the predictors of those transitions; and 3) identifying predictors of longer lengths of time CC RNs remain in CC before making a transition.

The CC RN Workforce: Demand and Challenges

Intensive care units emerged in the late 1940s and early 1950s so that nurses and physicians could provide “watchful vigilance” to paralyzed polio victims (Fairman, 1992; Weil & Tang, 2010). Since that time, there has been considerable growth in the number of ICUs in U.S. hospitals (Halpern & Pastores, 2010; Ward & Chong, 2015), with a notable 15% growth between 2000 and 2009 to result in a total of 77,809 CC beds for critically ill patients (Wallace et al., 2015). According to the American Hospital Association (AHA), the majority of acute care hospitals in the U.S. (n=6210) have at least one ICU and there are currently 5,462 CC-specific units in the U.S. (AHA, personal communication, April 17, 2019 and August 12, 2019). With data from the 2015 AHA annual survey, the Society of Critical Care Medicine (SCCM) (n.d.) reported a total of 94,837 ICU beds in 5,229 ICUs in the U.S. and, with data from the Centers of Medicare and Medicaid Services Healthcare Cost Report Information System, the North Carolina Health Research Program (2020) reported a total of 90,840 ICU beds (9,215 in rural areas and 81,625 in urban areas) in the U.S. Additionally, many of these hospitals have multiple sub-specialty ICUs to provide care to specific types of critically ill patient (e.g. surgical, medical, pediatric, psychiatric, burn, trauma, cardiac, coronary, and pulmonary sub-specialty ICUs) (Barrett et al., 2014). Therefore, CC RNs not only receive the specialized training necessary to become CC RNs but also receive additional sub-specialty training to work and care for patients

with more specific medical and surgical needs. A growth in increased specialization of services has created higher demand for more specialty trained and skilled CC RNs to provide safe, high quality care to critically ill patients in these ICUs and other emerging clinical areas.

CC RNs provide care to approximately 55,000 critically ill patients every day, and to the more than 5.7 million patients admitted to ICUs, annually (SCCM, n.d.). Estimates of the number of CC RNs range from 288,234 RNs (or approximately 15% of hospital-employed RNs) (Spetz, 2020) to 328,932 RNs (or 20.9% of all RNs working in hospital settings) (U.S. Health and Human Services Health Resources and Services Administration [HRSA], 2010) to 512,000 nurses (SCCM, n.d.).² Membership in the AACN, the international specialty organization representing CC RNs and the granting body for CC specialty certification, reflects a steady increase in AACN membership over the past 6 years, with 95,612 CC RNs in 2012, 102,617 in 2014, and 120,042 in 2018 (AACN, personal communication, November 11, 2018). This trend suggests that the numbers of and types of sub-specialty CC RNs are likely increasing, however it is unknown whether these numbers are sufficient to meet the rising demand for CC and its services. While increasing the supply and training opportunities for RNs could increase the total number of CC RNs in the active workforce, nurse retention initiatives that value the specialized training of CC RNs and incentivize them to remain in CC may be less costly and more productive options for organizations.

CC RN Specialty Transitions

Transformations in healthcare delivery systems have resulted in new roles for nurses to advance their skills, wages, and careers. For example, the expansion of health insurance

²Differences in these two estimates may be due to the SCCM's inclusion of both practicing and not-practicing CC RNs (e.g. active and inactive) and nurses regardless of RN status.

coverage – most notably from the Affordable Care Act (ACA) in 2010 – resulted in an increased demand for RNs in home health care and outpatient ambulatory care settings to meet primary care needs (Spetz, 2014). CC RNs, like other RNs, have career flexibility because of their entry-level education and while this is often cited as a ‘benefit to being a nurse’ (Johnson & Johnson, 2018), there is remarkably little documentation about the nurse transitions that occur and how this flexibility affects the workforce.

CC RNs can remain in CC throughout their nursing careers (i.e., make no transitions), transition out of CC and into another specialty area, and/or transition out of the active nursing workforce altogether (e.g., pursue non-nursing jobs, become temporarily inactive, or retire; also referred to in this dissertation as attrition). No existing studies have examined the transitions of CC RNs out of CC into other specialty areas or out of the active nursing workforce. There is, however, an emerging body of literature focusing on non-CC RNs who transition between specialties or settings in areas outside of CC. Recently, two literature reviews identified and synthesized studies to examine nurses’ transition experience – Kinghorn et al. (2017) examined transitions of experienced RNs (i.e., those who have at least one year of clinical experience) into new clinical areas of practice and Ashley et al. (2016) examined the transition experience of acute care nurses into primary health care settings. Findings from both of these reviews suggest that nurses who transition experience certain psychological stressors, impacts, and social challenges that require support from either formal or informal systems within organizations. While this review of the literature (presented in Chapter 2) identified one study that examined nurse transitions *into* CC areas (Farnell & Dawson, 2006), no studies were found that examined nurse transitions *out of* the specialty. Therefore, further research is needed to provide fundamental information about how, when, and why CC RNs transition out of the CC specialty.

The findings of this research not only advance our understanding of the phenomenon of nurse transitions but also support the development of workforce policies to plan for and meet the growing demands for CC RNs.

Conceptual framework

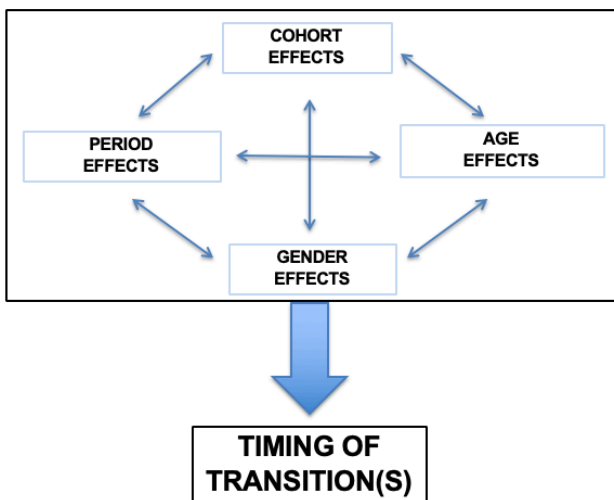
The conceptual framework that guided this dissertation of CC RN specialty transitions was developed from Life Course Theory (LCT). Research guided by LCT is based on the assumption that individuals (e.g., CC RNs) are active beings in dynamic social and cultural systems, both of which – the people and systems – change over time (Elder, Johnson, & Crosnoe, 2003; Giele & Elder, 1998). In studies of work and employment, LCT has been used to account for the ways in which broad socio-economic environments impact individual career experiences (Marshall, Heinz, Kruger, & Verma, 2001). Giele and Elder (1998) emphasize that an individual's behaviors (e.g., RN's education, initial specialty choice, transition out of CC) and their resulting life course trajectories (e.g., career pathways, organizational retention, retirement processes) depend on the interplay of four concepts throughout the course of their life. The key concepts of LCT are:

- 1) An individual's *location in time and space* and the co-occurring historical contexts (e.g., major events such as economic recessions, wars, certain social phenomena) affect their life course patterns over time.
- 2) An individual's *human agency* – or their active pursuit of individual and cohort goals to guide decisions and organize their lives – occurs through the opportunities and constraints of history and social circumstance.
- 3) Societal institutions and social groups share common experiences through their *linked lives*.

- 4) The *timing of life events* produces different effects and meanings for individuals who may be experiencing the same events but be in different developmental life stages (Giele & Elder, 1998).

Studies that rely on LCT, particularly those examining individuals' work histories, typically focus on the *timing of life events*. More specifically, researchers using LCT acknowledge the roles of social structures and temporality in individuals' behaviors, opportunities, and transitions, believing that these occur within and also inform longer trajectories and outcomes (Alwin, 2012; Giele & Elder, 1998; Mayer, 2009; Mortimer & Shanahan, 2003). Transitions (or changes in roles), individuals' expectations, responsibilities, and behaviors, are the units of analysis in the study of careers (Nicholson & West, 1989) and are considered to be markers of change that are contextualized by a person's demographics and the period in which he/she is residing (Alwin, 2012; Elder, 1975; Giele & Elder, 1998). Work histories are chains of transition cycles (Nicholson & West, 1989) and the timing of transitions occur as people and groups strategically adapt to achieve their individual and common goals within the opportunities and constraints of their historical and social circumstances (Giele & Elder, 1998). These transitions depend on what Giele and Elder and other LCT researchers refer to as period, cohort, age, and gender effects; the intersection of these effects informs individuals' long-term trajectories and life courses (Giele & Elder, 1998; Riley, 1998). Figure 1.2 provides a depiction of what Giele and Elder's model for transitions, and the conceptual framework upon which this dissertation was based upon.

Figure 1.1 Life Course Model for Transitions



A basic tenet of LCT is that where a person is “situated” in their life course when events occur makes differences in how these events affect them (Giele & Elder, 1998; Hendricks, 2012). For example, variations in the movements of nurses could be produced by the combination of the historical period in which nurses are situated in (period and cohort effects), the biological process of aging (age effects), and differences in transition patterns based on gender (gender effects) (Giele & Elder, 1998; Han & Moen, 1999).

Prior nursing workforce literature has largely ignored these contextual factors in examining nurses’ career transitions, both conceptually and methodologically. Studies of nurse transitions tend to be either atheoretical (descriptive in nature or not explicitly guided by a theory) or guided by theoretical frameworks that focus on individual and organizational levels, largely ignoring the influence of larger social and historical factors. Additionally, most studies employ research designs that measure transition at a singular cross-sectional point in time (e.g., not considering whether this is the CC RN first transition observed in the data). These designs do not account for the dynamic nature of nurse transitions into and out of the workforce over time,

and also fail to identify the timing of such transitions throughout RNs' careers. Thus, the impact of contextual factors on differences in the occurrence and timing of RN transitions were important to consider in a study of RN transitions out of CC.

Studies of careers, transitions, and work behaviors that employ LCT guided the theoretical underpinnings of this study. While there are no published papers of health workforce groups in the U.S. that reported using LCT, two dissertations and one report were identified. In her dissertation research, Livingston (2017) used LCT as a framework for qualitative interviews to explore how eight third age³ pediatricians, identifying as female, experienced career transitions and considered their influence on their professional and personal development. In her dissertation research, Fraher (2009) used LCT to inform models that examined and predicted physician career decisions about practicing in rural areas. Similarly, in her study report, Jones and colleagues (2017) used LCT to predict the occurrence of RN educational transitions. Fraher and Jones's works both relied on longitudinal licensure datasets to study physician and nurse transitions, evaluating these phenomena in the larger context of certain period and cohort effects (e.g., changes in the gender makeup of the physician workforce, policies to impact RN educational transitions, birth cohorts). These studies, as well as literature on LCT, career transitions, and nurse transitions, served as the conceptual underpinnings of this dissertation and are described further in Chapter 2.

³The "third age" is the span of time between retirement and the beginning of age-imposed physical, emotional, and cognitive limitations that roughly falls between the ages of 65 and 80. Long life expectancies and the improved health of older adults have led researchers to identify this as an emerging new life space for leisure, self-fulfillment, and purposeful engagement (Rubinstein, 2002).

Overview of Research Approach

Guided by LCT, the purpose of this dissertation was to examine CC RN transitions, and to identify the factors that predicted the occurrence and timing of those transitions guided by LCT. To address this purpose, annual RN licensure files from the North Carolina Board of Nursing (NCBON) between 2001 and 2013 were used for analyses. These licensure files contained annually compiled data on all active RN licensees in North Carolina (NC), gathered through a licensure renewal process that occurs on a bi-annual basis. Data for RNs who reported working in CC at least once during the study period and who did not report working in CC in 2000 were identified (using a unique identifier for each RN), linked together, and used to create a longitudinal dataset of responses for each individual RN over time. To identify RNs as either remaining in the active CC NC RN workforce or having left, data were categorized into one of the following groups:

- 1) RNs who worked in CC at any point between 2001 and 2013 and remained in CC throughout the remainder of the study period (i.e., RNs who made no transitions – or *remained in CC* – for all consecutive years after the year in which they first identified working in CC);
- 2) RNs who reported working in CC at any point between 2001 and 2013 but subsequently reported at least one occurrence of working in a different specialty area (i.e., RNs who made a *specialty transition*); and
- 3) RNs who reported working in CC at any point between 2001 and 2013 but became inactive or did not renew licensure at any point later during the study period (i.e., RNs who *exited the active NC RN workforce directly from their first time in CC*).

Multiple transitions and/or other different types of transitions throughout the study period were not addressed in this dissertation's analyses. Instead, these three categories were used to describe the retention of CC RNs in the specialty, and these two different types of CC RN transitions, and to examine the effects of LCT variables (e.g., period, cohort, age, and gender effects) on the occurrence and timing of RN transitions out of the CC specialty. The specific aims that were addressed in this dissertation are as follows:

Aim 1a: Describe the educational, demographic, geographic, and practice characteristics of the CC RN workforce in NC between 2001-2013.

The proportion of the NC RN workforce that was comprised of CC RNs, annually, was determined. Then, those nurses who identified CC as their primary specialty area for the first time at any point between 2001-2013 were separated; the age, gender, race, educational, and professional makeup of the CC RN workforce on an annual basis, between 2001-2013, was described.

Aim 1b: Describe the occurrences and types of CC RN transitions that occur during the 2001-2013 period.

Annual records for each individual, unique RN were linked to create a longitudinal record (i.e., "history") of employment for each RN throughout their study participation time. These histories were used to identify the occurrence and timing of a transition out of the CC RN workforce. Those RNs who identify working in CC at least one time during the study period were categorized into either a retention, specialty transition, or transition out of NC RN workforce group based on the first transition that they were observed to have made. Differences between these retention and transition groups were presented, and the specialties to which CC RNs make specialty transitions were identified. Poisson and logistic regression models were used

to test the following hypotheses about the occurrence and characteristics of specialty transitions:

H₁: Smaller proportions of CC RN specialty transitions will occur during the Great Recession (2007-2009) than in other years during the study period.

Aim 2: Examine the likelihood that RNs will make a transition out of CC, and the key variables from LCT that affect the transition.

Dichotomous variables were created to identify those CC RNs who make at least one transition out of CC and those who do not. Then, logistic regression models were used to model the occurrence of and test the main impacts of LCT predictors on transition outcomes. The following LCT effects were examined: period effects, or the year in which an RN reported working in CC; cohort effects, or the year in which the RN first qualified for RN licensure; age effects, or the age at which the RN first reported working in CC; and gender effects. Control variables identified from the literature as potential predictors of nurse transitions also included years of potential RN experience (e.g., the number of years that had lapsed since the RN had first qualified for licensure), the RN degree (e.g., the academic degree that qualified the RN for licensure and/or their degree when first observed to be in CC, and the highest nursing degree the RN had reported when first observed in CC), race, and practice location (e.g., rural versus urban). The following hypotheses were tested:

H₂: As the age of CC RN at first entry to CC increases, CC RNs are less likely to make a transition.

H₃: CC RNs who graduated from their entry-level nursing programs in more recent (i.e., later) years of the study period are more likely to transition out of CC than those who graduated in earlier years.

H₄: Male CC RNs are more likely to make transitions than female CC RNs.

Aim 3: Determine key variables from LCT that lengthen the time CC RNs stay in CC before making a transition out of CC.

Ordinal regression models were used to evaluate independent predictors of longer times until RNs make transitions. The following hypotheses were tested:

H₅: CC RNs who began working during the Recession (2007-2008) are more likely to remain in CC for longer periods of time than those who began working in CC prior to the Recession.

H₆: CC RNs who graduated from their entry-level nursing programs in more recent years of the study period are less likely to remain in CC for longer periods of time than those who graduated longer times ago.

H₇: As the age of CC RN at first entry to CC increases, nurses are more likely to remain in CC for longer periods of time than those of younger ages.

H₈: Male CC RNs are less likely to remain in CC for longer periods of time than female CC RNs.

Significance

An examination of CC RN transitions out of the CC specialty using a LCT perspective offers insights into behaviors of CC RNs and the greater RN workforce, and into how historical contexts and emerging policies affect these transitions. Findings from this dissertation help inform efforts to build the CC RN workforce by identifying CC RNs “at risk” of transitioning out of the specialty area and helping policymakers, organization leaders, and workforce planners develop retention efforts that target these nurses. Additionally, policymakers can use these findings to understand how social and historical events that occur outside of health care (e.g., economic recessions) affect the CC RN workforce; this knowledge can be used to aid the

development of specific policies to incentivize and facilitate the movement of previously experienced CC RNs back into active CC practice, or prevent the movement of CC RNs out of CC, as needed, during these events.

Understanding the occurrence and timing of specialty transitions also offers insights about how to capitalize on the knowledge and training of CC RNs, facilitate their transition to other specialty areas and roles, and build RN workforce capacity. For example, CC RNs' experiences with advanced technologies and the management of patients with complex medical needs gives them unique skills that support the shift in patient care from the hospital to home but also allow for shifts back into the hospital during times such as pandemics. Long-term home mechanical ventilation is one of the most advanced and complicated type of medical treatments provided outside of hospital settings, with considerable cost savings for patients and health systems, as well as improved patient outcomes (e.g. enhanced quality of life, integration into the community) (Dybwik, Neilsen, & Brinchmann, 2011; King, 2012). Educators and policymakers can use the findings from this dissertation about the movement of CC RNs to develop policies (e.g. financial or educational incentives) that help "move" CC RNs into this and other settings, and to address emerging patient and population health care needs. By drawing on the specific knowledge and skills of hospital-based CC RNs, this segment of the workforce could be "retooled" to transfer those skills outside of hospitals and into homes and communities, improve care provided to patients in homes, and support new models of care delivery. The findings of this examination of CC RN workforce transitions can also expand our understanding of RN specialty transitions in the general workforce and inform the development of future studies that take this broader perspective.

Chapter Summary and Organization of the Dissertation

This dissertation examined nurses' transitions out of the CC specialty area using a life course (LCT) perspective. This chapter described the growth of CC in the U.S. and presented insights into the current CC RN workforce and the specialty transitions that nurses make. An introduction was also provided to the dissertation's conceptual framework, purpose, aims, hypotheses, and significance. Chapter Two will present a review of the literature on LCT, the use of LCT to study workforce transitions in general, and nurse specialty transitions. Chapter Three will explain the methodology, study design, data management, and analysis procedures to address the aforementioned research questions and corresponding hypotheses. Chapter Four will present study findings. To conclude, Chapter Five will present a discussion and interpretation of study findings, describe study limitations, and address the implications of this study for policy, education, research, and practice.

CHAPTER 2. REVIEW OF THE LITERATURE

This chapter presents a review of literature on prior research and methodological issues germane to this study of CC RN work transitions. The chapter consists of six sections that present: 1) an overview of life course theory; 2) the period, cohort, age, and gender effects on work transitions; 3) work transitions of healthcare providers; 4) a literature review of the factors influencing RN specialty transitions and attrition; 5) the theoretical foundations of the study; and 6) the conceptual model and hypotheses of this dissertation study of CC RN transitions. A summary of the literature provides conclusions from findings across the six sections.

Overview of Life Course Theory

Life Course Theory (LCT) is a theoretical framework rooted in sociology and social psychology that examines the effects of major social and historical events on how people develop, behave, and age as they go throughout their lives (Elder, Johnson, & Crosnoe, 2003). Although referred to as a theory in the literature and in this dissertation, LCT is also known as the “life course paradigm”, “life course perspective”, or simply “life course” (Alwin, 2012; Bynner, 2016; Elder et al., 2003). Life course researchers use data – particularly longitudinal data – to explore the timing of a change in roles or statuses (a transition) and its relationship to socio-cultural structures, historical events, and developmental trajectories throughout people’s lives. These longitudinal data are a defining feature of life course research, as they allow for the examination of the multiple pathways of individuals and their developmental implications throughout the life span (Bynner, 2016; Elder & Giele, 2009).

Since its inception, research guided by LCT has grown significantly as an area of interdisciplinary study (Butz & Torrey, 2006). This dissertation relied primarily on the traditional cornerstones of life course research and carefully considered the applicability of contemporary studies of RN work transitions within this conceptual framework. In this dissertation, LCT was used to identify how the timing of decisions in RNs' lives (e.g., CC RNs' decisions to leave the CC specialty) varied across different historical periods and social cohorts. This dissertation serves as the beginning of an effort to increase knowledge on how RN specialty transitions occur throughout RNs' lives, and to understand the dynamic interplay between RNs' lives and changing structural, social, and cultural contexts in healthcare and beyond.

Transitions and their Timing

Examining the life course means analyzing change and the timing of events and transitions that comprise individuals' biographies (Hendricks, 2012). According to LCT, the timing of transitions throughout the life course depends on the nature of individuals' human agency (i.e., their individual goal orientation), and also the opportunities provided to individuals based on their socio-historical location over time (Giele & Elder, 1998; Moen & Sweet, 2004; Mortimer & Shanahan, 2003). A person's socio-historical location – referred to as “location⁴ in time and place” in Giele and Elder's paradigm – represents the noteworthy historical events that they (and others in their cohort) are exposed to and that influence their development and future trajectories. For example, the timing of when a woman decides to get married occurs not only by her individual human agency but also because of the socio-historical contexts that she is situated in; girls from deprived families in the Great Depression, for example, made transitions to

⁴The use of the term “location” is not used in the literal sense but instead refers to the historical, social, and physical contexts that a person is situated in.

marriage and homemaker roles earlier in life, whereas the nondeprived girls were more likely to make transitions that involved pursuing further education and combining paid work and family life (Giele & Elder, 1998).

Glen Elder, a sociologist who has made significant contributions to the development of LCT, wrote that “some individuals are able to select the paths they follow, a phenomenon called human agency, but these choices are not made in a social vacuum. All life choices are contingent on the opportunities and constraints of social structure and culture” (Elder, 1998, p. 2).

According to LCT, individuals make adaptations to the situations and events that they experience throughout their lifetimes and make decisions about the timing of their transitions based on both individual and contextual factors (Alwin, 2012; Elder, 1998; Giele & Elder, 1999). Therefore, the timing of life events, such as how and when a person enters the workforce or starts a family, is considered to occur within these larger contexts and to be an adaptive process to external events and available resources.

Studies that use LCT encompass a) *historical time*, or an emphasis on the significance on when an individual lives and experiences events (Elder, 1994; George, 2009; Giele & Elder, 1998; Moen, 2016; Settersten & Mayer, 1997; Settersten & Owens, 2002), and b) *biographical time*, or the biological and experiential life paths of individuals as they age as measured by the timing, duration, and sequencing of life statuses or roles (Han & Moen, 1999; Moen & Sweet, 2004; O’Rand, 1998). Historical time and biographical time are “interlocking temporal constellations” that are permeated by key factors of LCT and unfold throughout the course of individuals’ lives (Moen & Sweet, 2004). These temporal constellations provide an orderliness, referred to as age-normative structuring, about the ages in which people expect to accomplish certain transitions throughout their lives (e.g., transitions between work and into retirement).

This structuring of transitions and events are influenced by what some LCT researchers have referred to as period, cohort, and age effects.

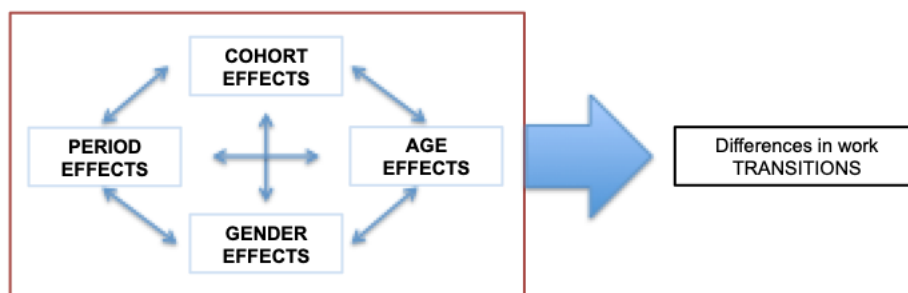
Period, Cohort, and Age Effects

Transitions and the timing of transitions represent individuals' strategic adaptations to reach their personal and societally shared goals. LCT emphasizes the need to follow individuals over time to identify how the timing of transitions in a person's life – such as a RN's transition out of CC – varies across different socio-historical contexts. According to Giele and Elder (1998), these transitions occur at this intersection of period, cohort, and age effects.

Period effects represent the influences of distinctive historical and cultural events on a person, or groups of people, of a given age, such as the impacts of smartphone technologies on contemporary social life and society or the effects of an economic recession on the CC RN workforce (Alwin, 2012; Hendricks, 2012; Giele & Elder, 1998). Cohorts are groups of people who have shared some critical experience during the same interval of time (Alwin & McCammon, 2003; Giele & Elder, 1998). Accordingly, a cohort effect refers to the distinctive formative experience that lasts and marks a group of individuals throughout their lives, such as college graduates who are looking for employment during recession times (Alwin & McCammon, 2003). Period and cohort effects are a linking of age and historical time, with the basic notion that where a person is “located” in life when events occur makes a difference in how these events affect them and affect their subsequent trajectories (Giele & Elder, 1998). Other elements of Giele and Elder's LCT model – human agency (e.g., individual goals to guide one's decisions and life courses) and linked lives (e.g., shared common experiences between families, social groups, and societal institutions) – come together through cohort and age effects and affect the timing of transitions.

This dissertation drew on the conceptual framework of LCT to investigate the predictors of CC RN transitions out of CC. A depiction of these period, age, and cohort effects – as well as gender effects, which will be described in further detail in later sections of this chapter – is provided in Figure 2.1. The next section describes a review of the literature on work and work transitions, and within the context of LCT effects, that have influenced this dissertation research.

Figure 2.1 Depiction of the Timing of Work Transitions



LCT and Work Transitions

Work – or more specifically, one’s paid employment (as opposed to unpaid labor such as volunteer work) – consists of the principal activities of most “prime age” (ages 25-55) adults in advanced economies (Moen, 2016). Work is crucial not only to provide financial support for individuals and their families, but also to shape individuals’ identities, values, senses of mastery, and expectations (Elder, 2014; Marshall, Heinz, Kruger, & Verma, 2001; Moen, 2016).

Individuals make dynamic choices about work throughout their lives, often changing roles in some way(s) and moving within and between occupations and organizations to progress along their work pathways and achieve their personal and professional goals (Dalton, 1989; Kalleberg & Mouw, 2018; Marshall et al., 2001; Moen, 2016; Moen & Sweet, 2004). Work transitions, the focus of this dissertation, reflect the choices and changes that CC RNs make to change their

work to non-CC or non-nursing areas. Appendix B summarizes the selected studies of LCT and work that are further described in this chapter.

Defining Work Transitions

Because of its use in everyday life, even the term “work transitions” can take on different meanings. Research on work transitions has been multidisciplinary and expansive, and work transition studies span a broad variety of topics that include but are not limited to describing opportunity inequalities between societies, examining the mobility of people among firms and organizations, and predicting movements into/out of the labor market (for examples, see Bleich, 2017; Kalleberg & Mouw, 2018; Mussida & Zanin, 2019). As one example, work transitions can be used to describe the anticipatory socialization that occurs when planning to change jobs (e.g., “I think I want to work in a different job”; for example, see Merton, 1968; Yamaguchi, 1998) or the in-between identity, referred to as the experience of liminality, which occurs when an individual is making tentative steps from their old status and towards a new one (e.g., “I am going through a transition at work”; for examples, see Bridges, 2009; Trice & Morand, 1989).

Even within a single field of study and profession, the term “work transitions” can produce different meanings in practice, theory, and research. For example, in nursing, a general review of the extant literature on “nurse work transitions” uncovered a broad range of topics of study, including transitions of RNs between specialties (specialty transitions); exits of RNs from the workforce (attrition); movements of RNs between countries (RN migration) (e.g., Brewer & Kovner, 2014); movements of RNs to and from organizations (RN turnover) (e.g., Brewer, Chao, Colder, Kovner, & Chacko, 2015; Brewer, Kovner, Greene, Tukov-Shuser, & Djukic, 2012; Cho, Lee, Mark, & Yun, 2012; Jones, 2004; Kovner, Brewer, & Fatehi, 2014); transitions of newly licensed RNs from education to practice (e.g., DeGrande, Liu, Greene, & Stankus, 2018);

transitions between employment statuses (full-time to part-time work, temporary inactivity) (e.g., Brewer et al., 2006); and movements between roles (such as transitions to advanced practice) (e.g., Barnes, 2015; Dillon, Dolansky, Casey, & Kelley, 2016; Illingworth, Aranda, De Goeas, & Lindley, 2013; Penn, Wilson, & Rosseter, 2008). These transitions primarily represent the professional, educational, and employment changes that RNs make throughout their careers.

In this dissertation, a work transition was signaled by the transition of a CC RN into a different specialty practice area (specialty transition) or their temporary or permanent departure from the workforce by way of becoming inactive, moving out of the state, discontinuing practice, retiring, or dying (transitions to inactive or non-licensure statuses). These types of work transitions do not refer to turnover behaviors or patterns between and within organizations – such as the movement of an RN from one hospital to another, or from one unit within a hospital to a different unit within that hospital – but, instead, describes a type of work transition that involves changes in specialty practice or exits from the nursing workforce altogether.

The Influence of Contextual Factors in Work Transitions

Historically, studies of work transitions have been generally limited to examining the impacts of personal factors (e.g., personality, job satisfaction, attachment), and have neglected the broader context in which transitions may occur (for examples, see Van Vianen, Feij, Krausz, & Taris, 2003; Wille, De Fruyt, & Feys, 2010; Wright & Perrone, 2008). Ng, Sorenson, Eby, & Feldman (2007), for instance, integrated the literature on intra- and inter-organizational work transitions (referred to as job mobility) and proposed a theoretical framework that encompassed the differences among the types of transitions that could occur over the course of a person's work life. Since its inception, this model has received considerable attention and been used to examine the evolution of careers, identify the factors influencing the nature of contemporary careers, and

propose future research directions to better understand how careers develop over people's lifetimes (Sullivan & Baruch, 2009). Ng. et al.'s model suggested that individuals remained in equilibrium and saw no urgency to transition until they were disrupted by structural factors, individual differences, and/or decisional factors. These structural factors, which included economic conditions, societal characteristics, industry differences, and organizations' staffing policies, were theorized to influence the patterns of transitions and job vacancies in the labor market. Similar to the model proposed by Ng et al. (2007), a LCT perspective also takes into account both structural (in LCT, referred to as period effects) and individual (referred to as human agency) factors on the transitions that people make throughout their lives. However, LCT was chosen over Ng et al.'s model because of the preponderance of literature that has applied, tested, and validated LCT in not only transitions that occur in work but in many other transition phenomena.

According to LCT, transitions refer to events that depict a distinct departure from prior roles and statuses and change to new ones. Transitions occur as individuals undertake actions to use the resources available and "strategically adapt" to the occurrence of external socio-historical events (Elder, 1975; Giele & Elder, 1998, p.10). For example, retired nurses who are in a country experiencing a pandemic may transition back into active work; male high school graduates who grew up during times of war may more readily seek military roles. Through a LCT lens, individuals are believed to engage in behaviors and pursue opportunities within the context and constraints of larger socio-historical contexts and to achieve their individual and collective goals (Elder, 1998; Giele & Elder, 1998).

According to this perspective, RNs may be more likely to make transitions from, for example, the bedside to advanced practice roles because of not only their individual

characteristics but also the expansion and increased demand for advanced positions in this contemporary healthcare environment, societal shifts in women's roles and employment patterns, and policy efforts to support and increase access to higher education as described in the Institute of Medicine's "Future of Nursing" report (Institute of Medicine [IOM], 2011). These are referred to as "period" and "cohort" effects and are believed to be both influence and be the product of persons' life course trajectories. Therefore, transitions can be viewed as markers in individuals' processes of adaptation and goal achievement and are 1) associated with changes in roles, expectations, responsibilities, and behaviors; 2) contextualized by persons' demographics and the period in which they are living; and 3) presumed to be age-differentiated decisions (Alwin, 2012; Giele & Elder, 1998). A review of the literature of specific period, age, cohort, and gender effects, as they pertain to work transitions, are described in the next sections.

Period Effects: The Effects of Economic Recessions on Work Transitions

Several studies of LCT and work have examined the effects of turbulence in the labor market, particularly that experienced during an economic recession, on individuals' work choices, health, and long-term trajectories (for examples, see Bynner et al., 2017; Crosnoe & Smith, 2017; Oreopoulos, von Wachter, & Heisz, 2012). Studies rooted in LCT suggest that individuals' lives are linked with historical change and that labor market turbulence can result in an accumulation of disadvantages throughout their lifetimes and affecting their trajectories. For example, in a recent study of 12,020 respondents in 11 countries, Leist, Hessel, and Avendano (2014) found that economic recessions in early and mid-adulthood were associated with unfavorable changes in men and women's working conditions and lower levels of cognitive function later in their lives. Findings from this study suggested that individuals who experience

economic recessions, especially during particularly vulnerable working ages, continued to be affected by these events beyond the timeframe of when it has occurred (Leist et al., 2014).

As economic growth slows, companies generate less revenue and often lay off workers to reduce costs, resulting in higher risks for and rates of unemployment. The quality of jobs also tends to decline during recession times (McLaughlin & Bils, 2001; Oreopoulos et al., 2012) and workers are more likely to experience more negative feelings about their work. Frone (2018), for example, used data from two national surveys of U.S. workers before and during Great Recession⁵ (n=2354 and n=2322, respectively) to focus on the impact of economic recessions on employed workers. He found that for these employed workers, the recession was not only associated with a net decrease in their physical and mental health but also associated with a decrease in the workers' attachment to, identification with, and involvement in the organization (i.e., their organizational commitment) (Frone, 2018). Additionally, the recession was associated with a net increase in *job insecurity*, or the perceived likelihood of involuntarily losing one's current job, and an even larger increase in *employment insecurity*, or the perceived likelihood of not finding comparable new employment in the event of job loss (Frone, 2018). Frone's findings suggested that negative impacts of an economic downturn extend beyond that of unemployment, and also may affect employed workers as they deal with personal problems, work problems, and insecurities about the future. For RNs and other workers, these problems may adversely affect their attitudes towards their work and thus, affect their behaviors and decisions to remain in work that they otherwise may have wanted to leave.

⁵ The Great Recession was arguably the most severe economic downturn in the U.S. since the Great Depression of the 1930s, lasting from December 2007 to June 2009 with several additional following years of slow economic recovery (Elsby, Hobijn, & Sahin, 2010).

Cohort Effects: The Effects of Graduation Cohort on Work Transitions

The use of LCT emphasizes the need for cohort analysis, or the comparison of differences and similarities between groups, to understand the effects of historical events throughout the life course (Giele & Elder, 1998; Shanahan, Mortimer, & Johnson, 2016). Membership in a cohort helps to “index” the unique historical period in which a group’s common experiences are embedded (Alwin & McCammon, 2003; Giele & Elder, 1998). By indexing those individuals who share similar events and experiences, studies that examine cohort differences can provide clues as to why changes are occurring and allow for the comparisons of similar experiences and events across different age groups (Giele & Elder, 1998, p. 241).

Often with LCT, birth cohorts are used because members of the same birth cohort share a social history, are affected by period effects at the same points in their life, and experience the life cycle at the same time (Alwin & McCammon, 2003; Giele & Elder, 1998). However, as a cohort is a group of people who have been exposed to critical experience during the same interval of time, other cohort examples from LCT have included marriage cohorts (i.e., people who get married in the same year), school-entry cohorts (i.e., people who enter school in the same year), and graduating cohorts (i.e., people who graduate college in the same year) (Alwin & McCammon, 2003). Smaller, more relevant delineations of cohorts, rather than popular conceptions of birth cohorts, have been recommended for use because they more precisely locate people in time and can compare the impact of historical events on different cohort groups with more specificity (Giele & Elder, 1998; G. Elder, personal communication, October 30, 2018). Therefore, this dissertation categorized RNs into cohorts based on when they graduated from an accredited nursing program, qualified for licensure, and likely first entered the labor force. These graduation cohorts – or more specifically, these cohorts based on the years that RNs qualified for

licensure – represented the distinctive formative experiences that RNs who graduated in the same year shared as they underwent their nursing education, initially entered the nursing workforce, and progressed throughout their work lives.

Graduation Cohorts' and their Experiences of Work in Newer, More Contemporary Times

There is some empirical evidence to suggest that, over time, work has become more geographically mobile and multi-directional (i.e., characterized by movements occurring within or across organizations and roles, rather than hierarchically upwards within a single organization) (Chudzikowski, 2012). Many work research scholars have argued that broad environmental changes – such as globalization, outsourcing, technological advances, and the growth of contingent work – have contributed to changes in work structures and the development of a “modern” career, or careers that change often and are not necessarily hierarchically structured (i.e., a career that consists of advancement within a single organization) (Barley, Bechky, & Milliken, 2017; Marshall et al., 2001; Sullivan, 1999). Literature on modern career trajectories has suggested that careers are becoming increasingly more “boundaryless” and that people are forced to take ownership of their own career growth and development, requiring them to change employers and occupations more frequently (Arthur et al., 1999; Arthur & Rousseau, 1996; Sullivan, 1999). Therefore, for CC RNs and other workers, the evolution and change of work structures and the nature of work from traditional to more contemporary models may result in differences between work behaviors and patterns in each successive cohort of workers.

Few studies have examined how the work trajectories of different cohorts, and of the same ages, have unfolded over time. One study by Lyons, Schweitzer, Ng, & Kuron (2012) examined the work histories of individuals from different birth cohorts to assess the changing

nature of career patterns through this generational⁶ lens. In their study of the Canadian labor force, Lyons et al. (2012) interviewed 105 people about their work histories (which they refer to as “career stories”) and used respondents’ retrospective biographical data to examine and compare differences in career patterns between birth cohorts in five-year career stages (e.g., when participants were 20-24, 25-29, 30-34, etc.). They compared intergenerational differences in job mobility among four birth cohorts of workers (Matures, Baby Boomers, Generation Xers [Gen X], and Millennials⁷) with analysis of variance (ANOVAs) of the mean number of job changes and generational cohort. These authors hypothesized that, because of the higher number of opportunities associated with newer work arrangements, members of each birth cohort would have greater job mobility in each of these career stages (i.e., more job moves within each five-year age band) than the birth cohorts that preceded them during the same career stages.

Lyons et al.’s (2012) findings partially supported their hypotheses, as Millennials had the highest average number of job changes of all four generations in each of the five-year age bands. For example, when they were between the ages of 20-24, Millennials averaged 2.59 job changes, Gen Xers averaged 1.28 changes, Boomers averaged 1.39 changes, and Matures averaged 0.60 changes, and these differences between these groups were statistically significant. Lyons et al. (2012) found that the “modern career”, which they characterized by more frequent job mobility changes, was evident across all four birth cohorts of workers. Although Gen Xers between the

⁶The term “generations” (e.g., Gen X, Millennials, Generation Z, etc.) is a popular convention for birth cohorts in career and organizational psychology literature. Although these authors may refer to the same concept, this can present some confusion and conflict with LCT terminology. In keeping with LCT definitions, this dissertation uses birth cohort in place of generation cohorts, reserving the term generations to kinship relations within a given family.

⁷Lyons et al. (2012) categorized these four birth cohorts as the ‘Mature generation’ (individuals born prior to 1946), Baby Boomers (born between 1946-1964), Gen Xers (born between 1964-1979), and Millennials (born after 1980).

ages of 20 and 24 averaged significantly fewer changes than their Millennial counterparts, few of the other pairwise generational differences at the same ages (i.e., career stages) were significant. Therefore, there was limited evidence to support the notion that careers were becoming “less traditional” and characterized by more change, with each successive generation.

Lyons et al. (2012) study was limited by their small convenience sample but their findings raise questions about the degree to which individuals’ work histories are actually changing from cohort to cohort. Popular notions of generational differences in attitudes, values, and behaviors are commonly discussed among workplaces, organizations, and media. However, Lyons et al.’s (2012) findings suggest that the mobility that is often associated with more recent cohorts may reflect changes brought on by the modern economy, rather than the prevailing cohort behaviors and cultures themselves. Therefore, in this dissertation, more recent and earlier graduation cohorts were compared, with the effects of age being controlled, to elucidate this relationship and identify whether there were any differences between cohorts or indications about the effects of newer work structures on transition outcomes.

Age Effects

In studies of LCT, the timing of events has typically been addressed in an event history framework that focuses on “age-normative structuring” (Han & Moen, 1999; Mayer, 2009; Neugarten, Moore, & Lowe, 1965; Pavalko & Elder, 1993; Settersten, 2003; Shanahan, Mortimer, & Johnson, 2016). Studies with LCT perspectives emphasize the interdependence of aging and social norms and change, and the importance of age in structuring how people organize their lives and make decisions about family, education, and work (Macmillan & Copher, 2005; Neugarten et al., 1965; Riley, 1987). Life course research suggests that, in societies, biological age is tied to common notions about socially appropriate behaviors (for

example, the colloquialism to “act your age”) and for the proper timing and progression of experiences and roles (for example, the age in which people expect to get married and start families). This age-normative structuring is believed to calibrate people’s movements throughout their lives, creating an orderliness in their transition points between roles and states of being; people “march to a clock”, particularly with the structures that support education and work, and move between courses and roles via graduations and promotions in a sequence that occurs within societally prescribed time limits (Hendricks, 2012; Riley, 1987; Settersten, 2003).

In their classic study of middle-class age norms in the U.S., Neugarten et al. (1965) used age-graded timetables for men and women to ask individuals (n=400) about the “best” age at which to accomplish a series of life transitions (e.g., marriage, settling into a career, childbearing, and retiring). Neugarten et al. (1965) found a high degree of consensus around the specific ages at which individuals expect to experience these life transitions, supporting the notion that a “prescriptive timetable for the ordering of major life events [exists]...[and that] this normative pattern is adhered to, more or less consistently, by most persons in the society” (p. 711). More contemporary research studies suggest that there may be more heterogeneity in the age norms referred to in Neugarten et al.’s study (Braboy Jackson & Berkowitz, 2005; Han & Moen, 1999; Settersten, 2003), but other LCT researchers have consistently found patterns in the transitions, and the timing of transitions, that groups of individuals make (e.g., Birkett et al., 2017; Jepsen & Choudhur, 2001; Kojola & Moen, 2015). Specifically in studies of work transitions, life course researchers have demonstrated that age matters in terms of how individuals progress through and out of their working years (e.g., Han & Moen, 1999; Moen & Sweet, 2004).

Depending on their age and developmental stage, individuals may be more prone to making work transitions. In one of the earliest and most cited conceptual models of career development, Donald Super (1953; 1957) emphasized a lifespan approach to career choice and adaptation. In his model, individuals progressed through a series of life and work stages with specific age-related milestones. For example, he found that young individuals between the ages of 15-24 were typically focused on developing their self-awareness and exploring career options until they settled into a role that would carry them through the remainder of their career (Super, 1957). Meanwhile older individuals, those between the ages of 45 to 64, were focused on upgrading their skills and holding onto their positions while managing issues such as health and family (Super, 1957).

In the U.S., some researchers contend that contemporary young adults with high school or college degrees are enabled by the U.S. economy and structures to have lengthy periods of educational and occupational exploration (one that consists of frequent change and transition) until obtaining the careers that they want (Arnett, 2000; Mortimer, Vuolo, Staff, Wakefield, & Xie, 2008; Vuolo, Staff, & Mortimer, 2012). Although comparisons between age, career development, and transitions between fields have not been specifically repeated in RN populations, it is reasonable to assume that RNs may structure their lives according to their ages and share the same values (and thus, behave similarly) to those in other industries and fields. The effects of age, as they pertain to RNs specifically, will be described in further detail in the ‘Age and RN Transitions’ section of this chapter.

Gender Effects

Finally, the works of several researchers, particularly those of Matilda White Riley and Phyllis Moen, have brought attention to the need to include gender effects in studies of not only

work but the life course altogether (Bynner, 2016; Dannefer, Uhlenberg, Foner, & Abeles, 2005; Giele & Elder, 1998; Moen, 2005; Moen, 1992; Riley, 1994). Classic studies of work have typically reflected men's, not women's, experiences (Moen, 2005), and contemporary work researchers have recommended that studies aim to document and examine the outcomes of women's changing positions in contemporary structures of society, work, and employment (Marshall et al., 2001; Moen, 2016; O'Rand, 1998). An emerging body of literature has demonstrated that gender has a persistent, if not cumulative, role in work history development and that its impacts are observed at various stages throughout women and men's lives (Huang & Svreke, 2007; Lorz & Muhleck, 2019; Marshall et al., 2001; Schoon et al., 2007). Gender disparities and processes of gender inequality may vary at different stages of individuals' working lives, and the role sequencing that occurs for women may further exacerbate their economic disadvantages in society (Braboy Jackson & Berkowitz, 2005). Therefore, the inclusion of gender effects in this research about RN work transitions was not only justified but essential. Few studies of LCT and work transitions, however, have examined work in professions that have far greater proportions of females than males, as is the case in nursing. Studies of gender differences in professions and industries that have equal distributions of females and males, or were predominantly male, may not be as relevant to studies of RNs. Gender was found to be a relatively common variable that was used in studies of RN work transitions, and these findings will be described in further detail later in this chapter.

LCT and Work Transitions in Healthcare

A review of the literature in health care journals was conducted to identify published studies that used LCT to evaluate work transitions of any health workforce or occupational groups in healthcare journals. With the assistance of a librarian, unsupervised machine learning

was used to increase efficiency in the search process, limit the number of documents to be screened manually, and determine overall cluster classification of titles and abstracts. Machine learning and natural language processing algorithms are currently and widely used to retrieve relevant documents for literature reviews (Bishop, 2006; Varghese, Cawley, & Hong, 2018) and this particular strategy used k-means algorithms, one of the simplest and most popular unsupervised machine learning algorithms, to group similar key words and phrases together and assign each document (i.e., publication) to one of ten clusters based on identified data points. Based on Varghese et al.'s (2018) recommendations, ten clusters were selected to capture the variance of topics found in the scientific literature and to reduce over-specificity. A search strategy consisting of focused key words in two databases, CINAHL and PubMed, was used to identify studies published in English that examined workforce and employment using LCT. Results of this clustering algorithm included the identification of studies with relevant key words such as retirement, work, labor, employment, women, and market (n=1961). However, when each of these relevant studies was individually reviewed, it was confirmed that there were no published, peer-reviewed studies of RNs or any type of health workforce that reported using LCT to guide their research.

Therefore, an additional review of dissertations and other grey literature was conducted. This search identified only three unpublished studies – two dissertations (Fraher, 2009; Livingston, 2017) and one unpublished report (Jones, 2017) – that used LCT to study work transitions of the U.S. health workforce. Fraher (2009) and Jones' (2017) use of longitudinal datasets to model transitions of physician and RN workforces were particularly relevant to this dissertation, both conceptually and methodologically. These two studies are reviewed in detail in the next section.

LCT and Physicians' Rural Transitions

Fraher (2009) examined whether work transitions into rural practice varied for physicians of different birth cohorts and whose working lives had unfolded during different structural and historical contexts. With physician licensure data from 1980 to 2005, she described the evolving landscape of the practice of medicine in rural North Carolina, and developed models to test the effects of period, birth cohort, age, and gender on the probability of physicians moving to a rural county for their first practice location or making a transition into rural practice later. Using multinomial logistic regression and survivor analyses, she found significant gender, birth cohort, age, and interaction effects. For example, male and female physicians in the Gen X cohort and in each age group were less likely than earlier birth cohorts to move into a rural county for their first practice location. Female physicians in earlier birth cohorts were significantly less likely than male physicians to choose rural practice settings for their first practice location. In testing interactions, she found that the effects of gender varied by birth cohort and was much smaller in the Gen X cohort than earlier cohorts. With respect to age, she found that physicians over the age of 50 were more likely to move into a rural county for their first practice location than those physicians aged 30-39. Additionally, she found that for those physicians already in practice, the rural transition rate was highest before the mid-30s and declined rapidly until age 50, experiencing another increase between the mid-50s and age 70.

Although a different health workforce population was examined (physicians as opposed to RNs) and a different type of transition (i.e., rural transitions as opposed to specialty transitions) was examined than in this dissertation, Fraher's (2009) research illustrates the importance of elucidating period effects that influence healthcare workers' practice decisions. Her work demonstrated how much workforce researchers have to gain from using LCT as a way

of framing work transitions and provided an example of the applications of LCT to this study of RN work transitions.

LCT and RN Education Transitions

Similarly drawing on a LCT perspective, Jones (2017) used RN licensure data from 1980 to 2013 to examine the nature and timing of RN educational transitions and how they shaped RN work trajectories along educational and professional pathways. In her retrospective longitudinal cohort study, she examined how LCT factors – age, gender, race, marital status, generational cohort, basic nursing education, and employment location – affected the likelihood of transition and time interval to educational advancement. She found that the characteristics of RNs that predicted transition to the bachelor of science in nursing (BSN) included only the factors that reflected educational opportunities: initial educational preparation degree (RNs with associate degrees), employment (RNs who worked in hospital settings), and RNs who were licensed at younger ages (between 18 and 21 years of age). Birth cohorts and demographic characteristics (such as gender, race, and marital status) did not predict transitions to the BSN level. However, at the graduate level, some LCT characteristics predicted transition occurrences and Jones (2017) found that those RNs who were most likely to transition to obtain a masters or doctoral degree were: White, female, born between 1965-1979 (Gen X), licensed between 1986-1995, initially licensed in the U.S., licensed at a younger age (between 18 and 20 years of age), and never licensed as an LPN.

Jones' (2017) study was unique in its use of LCT to guide a study of nurse educational transitions, and to identify these LCT effects. These effects, specifically the effects of RN age, birth cohort, and licensure year on the likelihood of educational transitions, demonstrate a beginning step in applying LCT to nurse workforce research and understanding how LCT

variables can affect RN work transitions. In the next section, studies of specialty transitions in nursing and transitions out of the nursing workforce (i.e., attrition) are reviewed and described, with a focus on how they contributed to the hypotheses in this dissertation.

Studies of RN Specialty Transitions and Attrition

A review of the literature to identify papers that described the predictors of RN specialty transitions was conducted. In this review, two recent literature reviews that focused on experienced RN transitions into new or different clinical areas of practice were identified. Few of the studies in these literature reviews described predictors of transition; instead, these reviews identified a number of studies that examined RN experiences when undergoing transitions into new specialties and settings (Kinghorn et al., 2017) or from acute to primary care (Ashley, Halcomb, & Brown, 2016).

Taken together, these two literature reviews suggested that RNs who undergo specialty transitions experienced emotional challenges, had certain personal and professional training needs, and could be more successful in their transitions if they were supported by certain formal and informal onboarding processes. In a review of 10 studies, for example, Kinghorn et al. (2017) found that RNs who made specialty transitions expressed concerns about the transferability of their prior skills and knowledge, doubted their ability to fulfill these new roles, and underwent some type of negative emotion during their transition. In the transition from acute care to primary healthcare settings, Ashley et al. (2016) found that RNs often reported feeling unprepared for their transition, as if they had limited knowledge, and that they lacked the clinical or communication skills to function autonomously or effectively in their new work. Findings from Kinghorn et al. (2017) and Ashley et al. (2016) have important implications for organizations as they develop policies and programs to facilitate RN transition experiences.

However, as these reviews only offered insights into the experience of transition and its outcomes, an additional review that focused on identifying factors that influenced RN transitions out of one specialty area and into different ones was conducted.

This review of the literature on factors that influence RN specialty transitions yielded 9 studies⁸. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) in Appendix A demonstrates how this literature was narrowed according to inclusion and exclusion criteria *a priori*, and these papers are summarized in Table 2.1.

⁸For brevity, the methods of this review are not described but a PRISMA diagram is provided in Appendix A. This review identified empirical studies of RN specialty transitions published in peer-reviewed journals, in English, within the last twenty years. Studies that did not describe the motivations or predictors of specialty transitions, focused only on newly licensed RNs, or described non-specialty transition phenomena were excluded.

Table 2.1 Summary of Nurse Specialty Transition Studies (n=9)

Author, Date	Location	Purpose	Type of Specialty Transition(s) Examined	Methods Sample	Key Findings
Abrahamsen (2019)	Norway	To investigate how undergraduate nursing students' career expectations relate to their career choices in first 10 years of their careers, particularly in care of older people	Settings: general hospital care, care of older people, psychiatry and drug abuse treatment, outside core fields of nursing, outside nursing*	Longitudinal study based on questionnaire survey and register data of 10 years since graduation Nursing students (n=445)	- After graduation, the likelihood of working in care of older people correlates with nurses' expectations of part-time work. - The highest proportion of nurses entering care of older people had left from general hospital care. The lowest was from psychiatry.
Alameddine et al. (2009)	Canada	To analyze career trajectories of RNs 1 year after leaving hospitals	Settings: hospital, long-term care, community, other*	Retrospective longitudinal survey RNs (n=201,643)	- Many nurses who left hospitals dropped out of the Ontario nursing labor market (between 38.6-63.3%). - Very few nurses leaving hospitals moved into the community sector (between 7.3-19.3%). - The proportion of attrition was higher for registered practical nurses (compared to RNs) and increased with age.
Ashley et al. (2017)	Australia	To explore why RNs transition from employment in acute care to primary health care (PHC) settings	Acute care to primary health care settings	Mixed methods: national survey and semi-structured interviews RNs (n=171 and n=13)	- The most important factors affecting nurses' decision to transition to primary health care were balancing life and responsibilities, improved work hours to suit personal lifestyles, and the opportunity to increase work satisfaction. - Nurses described the physical demands and stress associated with acute care employment to be a factor in their decision to transition. - Salary and employment conditions, location of the work closer to home, and being the first job opportunity that arose were identified as the least important factors influencing transition.

*Also examined setting transitions in combination with transitions of the larger active nursing workforce (i.e., attrition)

Table 2.1 (continued)

Author, Date	Location	Purpose	Type of Specialty Transition(s) Examined	Methods Sample	Key Findings
Farnell & Dawson (2006)	United Kingdom	To explore the experience of RNs new to critical care and what factors influence their transition experiences	Transitions into critical care	Longitudinal qualitative study Critical care RNs (n=14)	• RNs came to critical care for knowledge and skills acquisition and the patient-to-nurse ratio. • RNs required a period of time to enable them to socialize to their new environment
Hartung (2005)	United States	To generate theory of how RNs transition to home health, and the factors that influenced success	Acute care to home health care settings	Open-ended and semi-structured interviews Home health RNs (n=14)	• Dissatisfaction with acute care practice and its impact on quality of life were key considerations in the decision to leave. • Nursing work in acute care systems was seen as a daily struggle of meeting patients' needs despite a minimally supportive work environment.
North et al. (2014)	New Zealand	To describe temporary and permanent separation patterns and changes in nursing over 5 years	Settings: hospital, community, residential care, nursing agency, government agency and educational institution, other*	Retrospective cohort analysis RNs aged 50+ years (n=12,606)	• A quarter of the cohort was no longer practicing after 5 years. • On re-entry to the workforce, 56% returned to the same clinical area. • Annual separations from the workforce declined sharply during the global financial crisis (2008-2009) and more of those leaving re-entered the workforce.
Rosser & King (2003)	United Kingdom	To gain an understanding of the experiences of RNs making the transition into hospice nursing	Transitions into hospice care	Semi-structured interviews RNs, mentors, team leaders (n=11)	• Nurses anticipated higher nurse: patient ratios in these areas and had expectations about ward teaching and education programs, the hospice atmosphere, and approach to the dying that informed their decision to transition. • Expectations about being able to provide a higher quality of holistic care influenced RNs decisions to work in hospice.

*Also examined setting transitions in combination with transitions of the larger active nursing workforce (i.e., attrition)

Table 2.1 (continued)

Author, Date	Location	Purpose	Type of Specialty Transition(s) Examined	Methods Sample	Key Findings
Winters (2016)	United States	To describe the process that RNs go through to become and remain emergency RNs	Transitions into emergency department nursing	Semi-structured interviews Emergency RNs (n=7)	• Emergency nurses who “joined the troops” described this phase in two subcategories: “seeking a difference” and “recognizing opportunities”. • The perception of previous roles on other units to be “boring and monotonous” or that “learning had plateaued” were influential factors leading to transition.
Zurmehly (2007)	United States	To describe community nursing practices and to explore factors associated with transition of clinical practice from acute care	Acute care to community practice settings	Qualitative case study Community RNs (n=48)	• Acute care practice experience included obstetrics, intensive/critical care, emergency room, and medical-surgical nursing, with the majority of participants working less than 5 years in these settings. • Community nursing practice is seen as nursing that captures a holistic approach and that the “taken-for-grantedness” of acute care nursing was replaced with “making a difference”. • Almost all of the participants reported that they were able to transition successfully and would never return to the hospital.

*Also examined setting transitions in combination with transitions of the larger active nursing workforce (i.e., attrition)

Studies of RN specialty transitions were primarily from the U.S. (n=3), and with others from the United Kingdom (n=2), Canada (n=1), Australia (n=1), New Zealand (n=1), and Norway (n=1). Studies used qualitative methodologies (Farnell & Dawson; Rosser & King, 2003; Winters, 2016; Zurmehly, 2007), quantitative survey methods (Abrahamsen, 2019; Alameddine et al., 2009; North, Leung, & Lee, 2014), and mixed methods (Ashley, Halcomb, Peters, & Brown, 2017; Hartung, 2005). In these studies, specialty transitions typically spanned larger and broader sub-categories than specialty areas, such as transitions from hospital to out-of-hospital settings (e.g., to community or primary healthcare settings), rather than more specific specialties such as CC and other hospital areas.

Although several qualitative studies were identified that offer insights into RNs' rationales for making specialty transitions, no studies were identified that empirically tested the relationships between predictors and RN specialty transitions. Therefore, to augment those findings of RN specialty transitions and further inform this dissertation, this review of the nursing literature included an additional step to identify studies of predictors of nursing attrition (see Table 2.2). While these studies of nursing attrition are somewhat distinct from those studies of specialty transitions per se, they provided additional information about the demographic predictors of RN attrition as a type of work transition. The findings of the literature reviews of these two types of transitions – specialty transitions and attrition – are described in the next section.

Table 2.2 Summary of Nurse Attrition Studies

Author, Date	Location	Purpose	Conceptual Framework	Methods Sample	Findings
Addor et al., 2017	Switzerland	To investigate career paths and nurses' reasons to leave sectors of care and nursing altogether	None stated	Graduates from 26 nursing schools in two cohorts (n=287)	- About half of the respondents reported that they had left their institution or nursing at least once during the career span under study (15-25 years) - The most frequently mentioned reason for leaving the job was the curiosity to explore other health sectors or career paths. - Other reasons for leaving included family life versus work, institutional factors at healthcare unit levels, global institutional factors
Alameddine et al. (2011)	Canada	To analyze the career transitions of RNs registered but not working (inactive RNs)	Labor economics framework	Retrospective, longitudinal analyses RNs registered in Ontario (n=215,687)	- Inactive RNs not seeking nursing employment are a heterogeneous group and include RNs on leave who are likely to subsequently rejoin the active workforce should appropriate opportunities arise. - Inactive RNs seeking a nursing job had the highest average rate of return to the active workforce. - RNs moving outside of Ontario were highly unlikely to be attracted back to the labor market.
Barron & West (2005)	Britain	To investigate the factors associated with RNs moving to different employment statuses over time (e.g. jobs outside nursing, unemployment, maternity leave, and family care)	None stated	Retrospective, event-history analysis RNs in the British Household Panel Survey (sample size not specified)	- Individual characteristics associated with shorter tenure in the profession included: being male, being younger, having a degree, and having been born in the UK. Many RNs left to care for their families. - RNs seem are vulnerable to leaving early in their careers but those who are retained for the first few years are likely to remain in the profession for the rest of their working lives.
Black et al. (2010)	United States	To compare the sociodemographic, market, and political factors of RNs who work outside of nursing	None stated	Retrospective analysis	- Baccalaureate education, children under age 6, higher family income, and years since graduation increased the odds of working outside of nursing for married nurses - Wages were a significant predictor of working outside of nursing for unmarried but not married nurses

Table 2.2 (continued)

Author, Date	Location	Purpose	Conceptual Framework	Methods Sample	Findings
Cheung (2004).	Australia	To investigate the decision process of former division one RNs in deciding to leave the profession.	Lee & Mitchell's Employee Turnover Model	Semi-structured qualitative interviews Former division one RNs (n=29)	- Leaving nursing was a difficult decision that was triggered by general dissatisfaction with working conditions, continual shortages of RNs, and disillusionment with the lack of career structure. - Younger participants expressed less time to deliberate about quitting, and that the decision process was easy and not traumatic.
Duffield et al. (2004a)	Australia	To identify the range of positions to which RNs moved when they left the profession, and their perceptions of nursing skills for these roles	None stated	Cross-sectional survey RNs working outside of nursing (n=154)	- Many RNs moved to management positions outside the health industry, and most undertook additional study after leaving nursing. - Highest ranked factors influencing decisions to leave nursing included: career development and promotion, equality with other professional careers, being treated as a valued health professional, shiftwork generally.
Duffield et al. (2004b)	Australia	To investigate why people who have left nursing became a RN, how long they stayed in nursing, and their reasons for leaving	None stated	Cross-sectional survey; exploratory and confirmatory factor analysis RNs working outside of nursing (n=154)	- Model incorporating factors 'legal and employer', 'external values and beliefs about nursing', 'professional practice', 'work life/home life', and 'contract requirements' explained 55.4% of variance in reasons for leaving nursing. - Personal characteristics of RNs, reasons for becoming a RN, and reasons for leaving explained 48% of variance of tenure in nursing.
Duffield & Franks (2002)	Australia	To identify the positions RNs take when they leave nursing and the skills	None stated	Semi-structured interviews; network sampling technique RNs (n=17)	- Many participants were employed in health-related fields, but others were in diverse areas such as business, landscape coordination, market research, etc. - Participants believe it was not only their academic attainment but also their practical skills which enabled them to achieve outside nursing. - Reasons for leaving included: reaching a ceiling in nursing or wishing to develop themselves in another direction, but also being offered a specific opportunity or wishing to develop in another direction

Table 2.2 (continued)

Author, Date	Location	Purpose	Conceptual Framework	Methods Sample	Findings
Fochsen et al. (2005)	Sweden	To examine factors contributing to the decision to leave nursing care	None stated	Surveys, factor analysis Nursing personnel (n=158)	• Unsatisfactory salary contributed most to decision to leave, followed by lack of professional opportunities and restricted professional autonomy.
Holmas (2002)	Norway	To describe RNs' exit rate from the public health sector	None stated	Retrospective, longitudinal analyses Female hospital RNs (n=5284)	• Wages and working conditions impact RNs' decisions to quit. • The probability of exit decreases with age, until a turnaround at 41 years. RNs have a higher exit rate the older they are. Years of RN experience also decreases the hazard rate out of nursing. • RNs with children younger than 7 years of age do not have higher hazard rates out of nursing than others. Married RNs have lower exit rates out of nursing than nonmarried.
Nooney et al. (2010)	United States	To investigate the timing and predictors of attrition from nursing and exit path (career change versus labor separation)	None stated	Retrospective, survival analysis RNs (n=29,472)	• Very little attrition before the age of 51 years, with over 80% of RNs expected to remain in the workforce. • Predictors of career change: higher levels of education, male, current enrollment in non-nursing degree program. • Predictors of early labor force separation: being married, providing care to dependents in the home (young children or elderly parents). • The rate of labor force separation is highest after 60, typical pattern for retirement.
Smith et al. (2007)	United States	To determine if differences in attrition exist between Black and White RNs, and where in the career process those differences are most pronounced	None stated	Retrospective, descriptive analysis College graduates with at least a BA in nursing (n=2899)	• Most Black RNs remain in nursing but a high percentage also move to non-nursing fields. • Higher percentages of Black nurses remain in nursing than White nurses.

Reasons RNs Make Transitions

This review of RN specialty transitions and attrition identified only one study that examined RN transitions *into* the CC specialty (Farnell & Dawson, 2006) and no studies that specifically examined specialty transitions *out of* CC. However, studies of RN transitions from acute care to outpatient specialty areas provided some insights into what might motivate RNs to transition out of CC and other hospital specialty areas and into non-hospital ones. In this review, RNs were found to be motivated to transition out of acute care by the desire to improve their quality of life (e.g., pursuing jobs with work conditions that allow for more flexible schedules or having the ability to establish engaging relationships with patients), to provide more holistic care to their patients, and to advance their knowledge and skills. These motivating factors are described in further detail in the next sections.

Improving Quality of Life

Four studies suggested that RNs were motivated to make transitions out of acute care to improve their work hours and/or their quality of life (Abrahamsen, 2019; Ashley et al., 2017; Hartung, 2005; Zurmehly, 2007). In a longitudinal study of Norwegian nursing students, for example, Abrahamsen (2019) found that the greatest proportion of RNs who had entered care of older adults had come from general hospital care. She found that, as students, RNs in these settings had expressed greater expectations for part-time work and higher desires for management positions than those RNs who remained in general hospital care. Abrahamsen's findings suggested that RNs who made transitions out of the hospital were motivated by certain work and lifestyle values that they had even as students. These desires for advancement and for certain part-time or fixed-day schedules suggested that RNs who left specialty areas in the

hospital were motivated to pursue non-hospital work for its job characteristics, rather than an interest in the clinical work and population itself.

Three studies described RNs' desires to leave acute care because of its stress and impacts on their quality of life. Hartung (2005) used multiple open-ended and semi-structured interviews of 12 home health RNs and two home health administrators in a northeastern state in the U.S. to investigate how acute care RNs successfully transitioned into home health nursing practice. Using a grounded theory approach and a systematic process of constant comparison, Hartung derived a theory of how professional RNs transitioned from the acute care to home health care setting and the factors that influenced success in the transition. Although the focus of her study was primarily to describe the *process* of transition, she also found that acute care RNs complained of working in an environment that was greatly affected by health care structures, delivery, and economics. She describes these RNs as often viewing their work as a "daily struggle of meeting the patient's needs despite a work environment that was minimally supportive of the RN's efforts" (Hartung, 2005, p. 374) and that they sought home health areas because of a desire to leave these environments. Hartung found that the RNs in her study shared a similar process of choosing a new setting in which to practice, contemplating the positives and negatives of remaining in acute care practice and assessing its impact on their quality of life. These RNs described actively seeking out and speaking to a variety of individuals about home health to learn more about the clinical area and weigh their high-priority needs (typically, to have less shift work or decrease the impacts of the work schedule on their family) and then deciding to move into this new specialty area as either as a trial or more committed option. Hartung's findings are limited to those RNs who chose to transition to home health but RNs, in general,

may also undergo a similar process of weighing the pros and cons of work between hospital and non-hospital specialty areas.

Ashley, Halcomb, and Brown (2017) had similar findings. These researchers used data from surveys (n=171) and interviews (n=13) of Australian acute care RNs to explore the reasons why RNs made transitions from acute care to primary healthcare settings. Ashley et al. (2017) found that, for these RNs, the most important factors in their decision to make the transition were: balancing life and responsibilities, improving work hours to suit personal lifestyles, and increasing work satisfaction (Ashley et al., 2017). Salary and employment conditions, location of the work closer to home, and being the first job opportunity were identified to be the least important factors that influenced transition. Similar to those home health RNs in Hartung's (2005) study, the primary healthcare RNs in Ashley et al.'s (2017) study also described the physical demands and stress that were associated with acute care employment and a desire to leave these environments as additional factors in their decision to transition to these new settings.

Finally, in her study of transitions from acute care to community nursing, Zurmehly (2007) found that RNs who made transitions valued not only the more flexible schedules but also the greater impacts that they could have on patients that were associated with their work non-hospital areas. In this qualitative case study, Zurmehly (2007) interviewed home health RNs from various geographical locations in the U.S. (n=48) to collect data that described community-based nursing practice and the factors associated with the transition of clinical practice from acute care. Many of the study participants described that the ability to control their schedules and arrange visits so that they had sufficient time to visit or teach patients was one of the factors that both attracted and retained them in home health settings. Some participants compared this flexibility with the lack of time they had to spend with patients in the acute setting, and almost

all of the participants in Zurmehly's study (97%) reported that they would never return to work in the hospital.

Taken together, these four studies indicated that RNs transition from acute care because of their desire to improve their quality of life, seek a more satisfying work environment, and advance their roles in these settings. Dissatisfaction was a motivator to transition from acute care to different clinical specialties that were believed to be associated with better work hours and less stress. In addition to their dissatisfaction with acute care settings, the home health RNs in Zurmehly's (2007) study also expressed a desire to provide more holistic care to their patients. Zurmehly found that this desire, in addition to wanting to pursue more flexible work hours and improve qualities of life, also motivated RN transitions from hospital areas.

Holistic Care to Patients

The home health RNs in Zurmehly's (2007) study described feeling "taken for granted" in acute care nursing and felt that community-based care allowed for a holistic approach and the ability to "make a difference". Rosser and King (2003) had similar findings. In their study of experienced RN transitions to hospice care nursing, Rosser and King (2003) found that these RNs were motivated to pursue palliative care because they had expectations about being able to provide a high standard of care that they felt was not met in the facilities and units that they had previously worked. These RNs described wanting to learn more about palliative care and symptom management, anticipated higher nurse-to-patient ratios to effectively deliver care, and wanted to provide higher quality of holistic care to patients and families. Although Zurmehly (2007) and Rosser and King's (2003) studies focused on community nursing and hospice RNs, this desire to learn about and provide more holistic patient care may motivate RNs to leave hospital settings for a variety of non-hospital and community areas. RNs may also be motivated

to make specialty transitions because of their desire to advance their knowledge and skills. These findings are discussed in the next section.

Advancing Knowledge and Skills

RNs, particularly those who have been practicing in the same clinical area for long periods of time, may also be motivated to make a specialty transition by their desire to explore other specialty areas improve their clinical nursing skills. Farnell and Dawson (2006) interviewed 14 RNs who transitioned into CC and aimed to explore the experience of RNs who were new to CC, identify the factors that influenced their experiences during this time, and evaluate the methods that could facilitate RN development. Study participants had previously worked in 1 to 8 clinical areas and had between 1 and 10 years of RN experience before becoming a CC RN. Farnell and Dawson (2006) interviewed these CC RNs 1, 3, and 6 months after their transition and found that all RNs in their study expressed wanting to work in CC because of their desire to improve their knowledge, experience, and clinical skills. RNs described how they were “not learning anything [anymore]” in the areas that they had previously been working in, and that they came to CC because they wanted to “know more” (p. 322). These RNs believed that they would have an improved ability to care for patients because of the improved staffing levels and lower patient to RN ratios in these CC areas.

Those RNs who made transitions into emergency room areas reported similar reasons for pursuing a specialty transition. Using grounded theory methods, Winters (2016) collected data from emergency room RNs (n=7) through semi-structured, open-ended interviews to explore the process of becoming an emergency room RN and the strategies that RNs used throughout the process. In their sample, RNs who previously worked in medical/surgical and intensive care units described that they found work on these units to be “boring and monotonous” and that their

“learning had plateaued” in these clinical areas. Also, an RN who had formerly worked in CC and made a specialty transition to the emergency room stated that “it always bothered me a little bit that I was very high tech, but I really didn’t know the basics...it would bother me that here I was with so much knowledge about balloon pumps but if I was in the parking lot and someone dropped dead in the parking lot that I wouldn’t have an idea what to do” (Winters, 2016, p. 415). Winters found that RNs perceived their work in the emergency room to make them “well rounded” and that it was a clinical area they believed would improve their skills and experience.

Findings from both Farnell and Dawson’s (2006) and Winters’ (2016) studies suggest that some RNs are also motivated to pursue transitions into clinical areas to advance their skills and knowledge. However, because of their qualitative study designs and focus on CC and emergency room areas, it is not clear how these findings may differ for RNs of different ages, for transitions between different specialties, or within changing times and health structures. Further research is needed to examine how, at a workforce level, RN transitions occur between specialties (e.g., which specialties RNs most commonly transition between) and what factors can predict and support these specialty transitions.

Predictors of RN Work Transitions

Studies of nurse transitions that focused on nursing attrition, or the exit of RNs from the general nursing workforce, provided insights into the effects of several demographic predictors – particularly economic recession, age, gender, and race – on the likelihood and rates of transitions out of the nursing workforce. This review of the literature identified only four studies that had empirically tested the effects of LCT, demographic, and/or professional variables on the likelihood or rates of transition out of the nursing workforce (Barron & West, 2005; Black,

Spetz, & Harrington, 2010; Holmas, 2002; Nooney et al., 2010). The predictors that emerged from this review of the literature are depicted in Table 2.3 and organized by variable.

Table 2.3 Predictors of Nurse Work Transitions in Identified Specialty Transition and Attrition Studies

Predictor Variable	Outcome Variable	Authors
Life Course Predictor Variables		
Historical events (e.g., recessions)	Separation from active nurse workforce ¹	North et al., 2012
Age	Drop out of nursing labor market after leaving hospital ² Acute care to primary health care ¹ Work outside of nursing Exit rate from hospitals* Career change and labor force separation*	Alameddine et al., 2009 Ashley et al., 2017 Barron & West, 2005 Holmas, 2002 Nooney et al., 2010
Gender	Work outside of nursing* Work outside of nursing* Career change and labor force separation* Leaving clinical practice area	Barron & West, 2005 Black et al., 2010 Nooney et al., 2010 Adoor et al., 2014
Marital status	Work outside of nursing Exit rate from hospitals*	Barron & West, 2005 Holmas, 2002
Race	Work outside of nursing Career change and labor force separation* Attrition ²	Barron & West, 2005 Nooney et al., 2010 Smith et al., 2007
Other Predictor Variables		
Qualifying degree	Movement to non-hospital sub-sectors ² Length of tenure in nursing* Work outside of nursing* Career change*	Alameddine et al., 2009 Barron & West, 2005 Black et al., 2010 Nooney et al., 2010
Years of experience	Work outside of nursing* Exit rate from hospitals*	Barron & West, 2005 Holmas, 2002
Salary/wage	Hospital nursing care ³ Exit rate from hospitals*	Fochsen et al., 2005 Holmas, 2002

*Statistically significant; ¹Qualitative finding; ²Descriptive data only; ³Factor analysis

Economic Recessions and RN Transitions

There is a gap in the literature about how period effects, such as economic recessions, affect RN transition behaviors out of the workforce, especially for RNs at different ages and at

different career stages. Although it has not been specifically examined, RNs may share the job and employment insecurities that Frone's (2018) participants expressed and may be less likely to make work transitions out of their current nursing roles (see 'Period Effects: The Effects of Economic Recessions' section). In one study of newly licensed RNs, for example, Brewer, Kovner, Yingrengreung, and Djukic (2012) compared two cohorts of newly licensed RNs (one licensed from 2004-2005 and another from 2007-2008) on their perceptions about job opportunities, job satisfaction, and intent to stay. They found that the RNs in the cohort that started work during the Great Recession (the 2007-2008 cohort) had higher organizational commitment and reported significantly greater intent to stay than those RNs in the earlier 2004-2005 cohort. Interestingly, however, job satisfaction levels were similarly low between both cohorts and those in the 2007-2008 cohort were also more likely to be searching for a new job. Brewer et al.'s (2012) findings between these two cohorts of RNs suggest that, despite being dissatisfied, RNs may be reluctant to leave a stable job during a time of economic recession and may be waiting for the recession to end before changing jobs. Although Brewer et al.'s study sampled only newly licensed RNs, it provides some insight into RNs' rationale for waiting to transition after a recession ends and when economic recovery occurs. RNs may be less likely to make transitions during recessions because they experience similar changes in job insecurity, employment insecurity, and physical and mental health as the participants in Frone's (2018) study.

This review of the literature identified only one study that examined the effects of economic recessions on the rates of transitions out of the RN workforce. In their study of RNs over the age of 50, North, Leung, and Lee (2014) used nurse licensure data in New Zealand to describe RNs' temporary and permanent separation patterns from the active nurse workforce

between 2006 and 2011. They found that annual separation rates of these RNs from the workforce declined sharply during the global financial crisis (2008-2009) while reentries into the workforce increased. They also found that, at the end of their study period, the number of RNs working in hospital areas had fallen by 45% while the number of those in community-based areas increased by 12%. Their study was descriptive in nature so whether these RNs made transitions from hospital areas to community-based areas, and in which years these types of transitions were made, is not known. However, findings from this study suggest that similar to other workers in other industries, RNs and their work behaviors may also be affected by larger contextual factors such as economic recessions.

Although North et al.'s (2014) study was the only identified paper that examined transitions *out* of the workforce during recession, several studies were identified that examined transitions *into* the nursing workforce. For example, and even amidst the record high-number of lost jobs for workers in the U.S., the Great Recession – hereafter, referred to as the Recession – actually brought about an unprecedented increase in hospital RN employment that seemed to contradict rising unemployment rates in the general labor market (Auerbach, Buerhaus, & Staiger, 2011; Buerhaus, Auerbach, & Staiger, 2009). Buerhaus et al. (2009) found that most of the employment increases were from older RNs (specifically, those over the age of 50) and postulated that older or retired RNs, who were predominantly female and married, were motivated to return to work or delay retirements because of anticipated spousal job losses and overall economic insecurity from these job and retirement investment losses.

Findings from the California nursing workforce have also supported Buerhaus et al. (2009) findings about the transition of older RNs back into the workforce during recession times. Using data from a biennial survey conducted by the California Board of Registered Nursing,

Yoo, Kim, Sasaki, Ward, and Spetz (2017) found that older, experienced RNs were more likely to work during 2010 compared to 2008, and were less likely to work in 2012 compared to 2010. Although the Recession ended in 2009, Yoo et al. (2017) argue that its effects were still felt in 2010 and these researchers used 2010 as a proxy for the most severe recession time. They found that older RNs were more likely to work during this recession time than when it first began, and then less likely to work after the Recession compared to the severe part of it. This suggests that older and more experienced RNs, motivated by economic recessions, may move in and out of the workforce with relative ease and could affect the availability of jobs and work for younger, newer cohorts of RNs. Tellez, Neronde, & Wong (2013), for example, found that except for newly licensed RNs, California RNs who were interested in working were generally employed and working as many hours as they wanted to during times of recession. These studies demonstrate the different impacts that economic recessions may have on RNs of different ages and at different points in their careers. While a recession may not result in high nursing unemployment rates like that typically found in other industries, these studies collectively demonstrated the impacts that economic recessions had on RNs' work behaviors and their returns to the nursing workforce, depending on RNs' age and where they were in their careers, and were used to inform hypotheses about these effects on CC RN transitions.

Age and RN Transitions

Nursing is a particularly labor-intensive profession, and research suggests that bedside RN roles within the hospital may be incompatible with the aging workforce. In his study of Norwegian RNs, for example, Holmas (2002) used administrative data on Norwegian RNs' wages, occupation, and working time to develop a hazard rate model examining what affects

RNs' propensity to leave the public health sector (n=5,284)⁹. He found that both wages and working conditions had an impact on RNs' exit; however, he also found that years of experience decreased the hazard rate out of nursing ($p<.01$) and that RNs had a higher exit rate the older they were ($p<.01$). The probability of RN exit, however, decreased with age and years of experience until about 41 years of age. This is an interesting finding because it suggests that age has a non-linear effect on the rate of transition, with those younger than 41 behaving differently than those over the age of 41. Anecdotes about the physical demands and stress associated with hospital nursing roles (e.g., Ashley et al., 2017; Duffield & Franks, 2002; Hartung, 2005) provided rationale for Holmas et al.'s findings, as RNs may be more inclined to continue their work in hospital settings until reaching a certain age in which the physical demands and effects of hospital work are no longer suitable for their lives.

Decisions about retirement may also prompt older RNs to make transitions from acute care to outpatient settings. In their study of RNs who made transitions from acute care to primary health care areas, for example, Ashley et al. (2017) found that older RNs in their sample reported the desire for a "stepping-stone to retirement" and thus made these specialty transitions so they could carry out and end their nursing careers. In their study of RNs in Ontario, Alameddine et al. (2011) found that RNs between 54 and 64 years of age (i.e., those in the decade nearing retirement) were far more likely to not renew their nursing registration and indicate that they were not seeking nursing employment than they were to change jobs within settings. Another study of nurse workforce data used survival analysis to investigate the timing, with respect to RNs age, of working in a non-nursing field or not working at all (Nooney et al., 2010). Nooney et al. (2010) examined survey data from the National Sample Survey of Registered Nurses

⁹In Norway, the public health sector includes most hospitals, except for five specialized private hospitals. These private hospitals represent less than 1% of the total number of hospital beds (Holmas, 2002).

(NSSRN) that had asked RNs how long it had been since they were last employed as an RN. She found that there was an increase in the rate of RNs who reported working in non-nursing fields before and during their 50s, and before nearing retirement age. Nooney et al. (2010) interpreted these findings to signal that nursing roles may be less appealing to individuals as they age and that, in planning for retirement, RNs may pursue alternate careers in non-nursing areas or dropout of the nursing workforce altogether. Although their study relied on cross-sectional, retrospective survey data, Nooney et al.'s (2010) study was unique in its use of nurse workforce data to investigate the timing of transition and the major variables predicting it. Future prospective, longitudinal studies in which RNs are followed, for example from licensure to transition, would increase knowledge about RN transitions at different ages and improve policymakers and researchers' abilities to forecast the future supply of working RNs and identify policies for retention.

Gender and RN Transitions

Though nursing is a predominantly female profession, male RNs are more likely to work in CC settings than in other practice areas (Buerhaus, Staiger, & Auerbach, 2000; Fenush & Hupcey, 2008; Stott, 2007; Hoffart, McCoy, Lewallen, & Thorpe, 2009; Ulrich, Buerhaus, Donelan, Norman, & Dittus, 2005). Men may be drawn to CC specialty areas because CC is a fast-paced, high-technology environment, and because CC may offer higher salaries. Additionally, men and women may have different motivations in pursuing work as RNs, even when they first begin their nursing education. For example, in their study of data on accelerated degree nursing students (n=3506), Hoffart, McCoy, Lewallen, & Thorpe (2019) found that, there were significant differences in male and female students' motivations for pursuing careers. Hoffart et al. (2019) found that male students rated the desire to help others significantly lower

than female students and were more likely to focus on features of nursing as a job (e.g., job availability, economic security, and flexible career paths). As a result of these motivations, men may be more interested in pursuing roles, either in nursing or outside of it, that embody more of these favorable job features.

Studies have also reported that men tend to take more direct and linear routes to reach management positions while women's work histories are more often characterized by breaks and lateral moves (e.g., transitions between staff RN positions rather than advancements up the nursing hierarchy) (Melamed, 1996; Nicholson & West, 1988; Tracey & Nicholl, 2007). A number of researchers have raised concerns about the lack of flexible working practices and work structures to enable women, who historically and predominantly assume a primary role in managing family responsibilities, to combine their paid work with unpaid family and personal roles. For example, in a mixed-methods study, Lane (1998) argued that small numbers of female nurses were present in high management positions and that they were excluded from these roles because of organizational processes that provided minimal support to women throughout their careers. She surveyed 643 nurses in three Wales hospitals to examine the factors that affected women's career advancement in nursing through ranks (referred to in this study as "grades"). In this study, she found that, despite the small number of men in her sample, a higher percentage of men were at the highest career ranks (i.e., management levels) and that women were concentrated in lower RN ranks and virtually absent at these higher levels.

Lane (1998) identified several organizational processes that appeared to operate against women's interests. The majority of women were concentrated in lower RN ranks and were virtually absent at management levels. Additionally, she found that those RNs who did not have

children reached higher ranks in shorter periods of time, and that the majority of those RNs who had progressed to the highest rank group did not have any children.

Several possible explanations for the lack of women in higher management ranks emerged in Lane's (1998) study. Female study participants reported having limited support to return to management after maternity leave (for example, women who wished to return to work part-time after maternity leave could only do so if they returned at a lower rank) and a lack of flexible working practices to combine paid work with their unpaid childcare responsibilities. They also reported limited nurse manager efforts to promote "family friendly" initiatives to enable them and other women to advance through organizational career hierarchies. She argued that men, who typically do not have to balance these work and family roles, were less "hindered" by these nursing work structures and thus, enabled to advance and make transitions out of lower nursing roles and into higher ones. Although the data from this study were collected more than 20 years ago and there have been many changes in health care and other employment sectors, differences in nursing opportunities and trajectories between men and women have remained a fairly underdeveloped area of study. However, a preponderance of literature in other industries and professions (and some with life course perspectives) have provided evidence that gender differences for professional advancement do exist and tend to favor men. Therefore, male RNs may be more likely to begin their careers in nursing, and remain in them, because of the opportunities afforded to them to pursue and advance their professional positions.

Conversely, other and more recent studies have found that being male was also associated with shorter tenures in the nursing profession (Barron & West, 2005), increased hazards of labor force separation (Nooney et al., 2010), and a greater likelihood of leaving clinical practice areas (Adoor et al., 2014; Black et al., 2010). Although male RNs may be more enabled to advance

quickly through the nursing hierarchy, they may also be more likely to leave and pursue opportunities outside of nursing. For example, in their study of “nurses who do not nurse”, Black et al. (2010) examined predictors of RNs who maintain an active license to practice nursing but work in a job for pay that does not require a professional nursing license. Black et al. (2010) found that the odds of male RNs working outside of nursing were over two times higher than the odds of female RNs choosing non-nursing work. Nooney et al. (2010) reported similar findings, including while being female increased the likelihood of labor force separation ($HR=1.29$, $p<.05$), males were more likely to work in non-nursing areas ($HR=1.6$, $p<.001$). Nooney et al. (2010) was the only study identified in this review that compared the effects of gender on two different types of transitions (labor force separation versus working in non-nursing areas) and suggested that, for female RNs, the decision to leave nursing occurs because of more temporary circumstances (e.g., family responsibilities) rather than more permanent ones such as pursuing an alternate career.

Black et al. (2010) additionally argued that their findings indicated how men may be more motivated by higher wages outside of nursing than female RNs, and how opportunities outside of nursing may be more available for male RNs than female RNs. Although few studies have examined and compared the trajectories of female versus male RNs, LCT suggests that gender may very well likely have significant and cumulative effects on RNs’ careers and late work-outcomes. Studies have yet to clarify the effects of gender on the opportunities available to RNs and their long-term career trajectories but, with policy initiatives to increase the number of males in the RN workforce, this may be rich area for future research and consideration. Additional predictors of RN work transitions, outside of those LCT variables, also emerged from this literature review and are described in the next section.

Additional Effects on RN Transitions

Race. This literature review identified two studies reporting that race had an effect on RN work transitions. Nurses who were White, compared to other races, were more likely to make career changes (HR=1.383, $p<.01$) and to separate from the labor force (HR=1.412, $p<.001$) (Nooney et al., 2010). In a descriptive study using longitudinal survey data from 1988 to 1993 of White and Black nurses, Smith, Crow, and Hartman (2007) found that more Black nurses remained in nursing than White nurses (90.8% versus 81.9%) at the end of their study period. Additionally, they found that, compared to White nurses, a higher percentage of Black nurses were employed in non-nursing¹⁰ jobs (30.4% versus 24.6%) and a higher percentage were working full-time (86.2% versus 70.5%). These findings were preliminary and descriptive only, and further research would be necessary to elucidate the reasons for these differences. However, because these studies suggest the effects of race on nurse transition outcomes, race was included as a control variable in this dissertation analysis.

Human capital variables: academic degrees and years of experience. In this literature review, having a BSN or graduate degree was found to be a strong predictor of RN career change (Nooney et al., 2014) and having a degree (versus a diploma) was associated with shorter times in nursing (Barron & West, 2005). Additionally, Black et al. (2010) found that years since RN graduation, and not age, had significant effects and increased the likelihood of working outside of nursing. Holmas (2002) also found that years of experience had a significant effect on the hazard rates out of nursing but in the opposite direction – higher years of experience decreased the exit rate of RNs in his study. In nurse workforce research, years of experience can take on many forms. For example, it might be a direct measure of tenure within an organization, the

¹⁰This paper reported nurses in non-nursing jobs to be employed in educational institutions, private-for-profit institutions, and private-not-for-profit organizations.

years in which an RN received nursing income (e.g., Holmas, 2002), or the years that have lapsed since RN graduation (e.g., Black et al., 2010). As such, both years of experience and degrees are variables that pertain to individuals' "human capital", or the intangible assets and attributes possessed by individuals that make them valuable to employers, and their effects on transitions are well-documented in studies of workers and work (Becker, 1994; Covell & Sidani, 2013; Han & Moen, 1999; Jones & Gates, 2007). Therefore, these human capital variables were believed to have effects on CC RN transition outcomes and were also included in this dissertation analysis.

Rural and urban differences. Because CC RNs typically are employed in ICUs, the supply and demand for ICU care (and their effects on CC RN transition behaviors) were important to consider in a study of CC RN transition behaviors. A recent report about rural and urban hospital bed occupancy rates indicated that, in almost every state, rural hospitals had lower acute care and ICU occupancy rates than their urban counterparts (North Carolina Rural Health Research Program, 2020). Additionally, research has found differences between rural and urban areas in terms of the numbers of clinicians and availability of health care services (Baernholdt, 2018), in RN work characteristics and environments (e.g., nurse manager leadership, collegial nurse-physician relations, and staffing/utilization) (Baernholdt et al., 2017; Cline et al., 2014), and in RN academic preparations (Jones, Yoder, & Baernholdt, 2019). Although it has not been examined as a predictor of RN work transitions per se, differences between urban and rural (or non-metropolitan) areas were also considered in this dissertation research because of their potential impacts on work for CC RNs.

Theoretical Foundations

Less than half of the papers identified in this review of RN work transitions explicitly cited the use of a conceptual framework to guide their variable selection and work. For example, those papers that did report the use of a conceptual framework cited frameworks such as role theory (Ashley et al., 2017; Zurmehly, 2007), turnover theory (Cheung, 2004), self-efficacy theory (Abrahamsen et al., 2019), or labor economics (Alameddine et al., 2011). Research about RN work transitions has largely ignored the social contexts in which people were situated and how these contexts potentially explain why people make certain choices and develop as they do. Arthur, Hall and Lawrence (1989) wrote that individuals' work histories "provide a moving perspective on the unfolding interaction between a person and society...[and] reflect the relationships between people and the providers of official position, namely institutions or organizations, and how these relationships fluctuate over time" (p. 8). Therefore, a life course approach to work transitions considered RNs' personal motivations for making transitions (i.e., their human agency) as well as their relationships to and within work structures and socio-historical contexts. Therefore, in this study of CC RN transitions, a conceptual framework that considered the effects of contextual influences was necessary. LCT was an appropriate perspective to guide this dissertation because of its focus on transitions and its emphasis on social and historical contextual influences.

To date, studies by Fraher (2009) and Jones (2017) were the only relevant examples of using LCT to examine individual healthcare provider behaviors in the context of changing healthcare structures and practices in the U.S. Both researchers used LCT in a retrospective analysis of longitudinal licensure data that employed cohort-sequential designs to assess the relationships among individual transition behaviors and what Giele and Elder (1998) refer to as

individuals' "locations in time and place". These studies, as well as the literature on LCT and work transitions, were used to inform the conceptual model and hypotheses of this dissertation via four key insights: 1) historical forces have shaped opportunities for RN work mobility and movement (*period effects*); 2) social, cultural, and educational forces have influenced RNs' work values and behaviors (*cohort effects*); 3) age is a complex variable that intersects with period and cohort effects to impact the timing of RN transitions (*age effects*); and 4) there are likely differences between male and female RNs in their transition behaviors (*gender effects*).

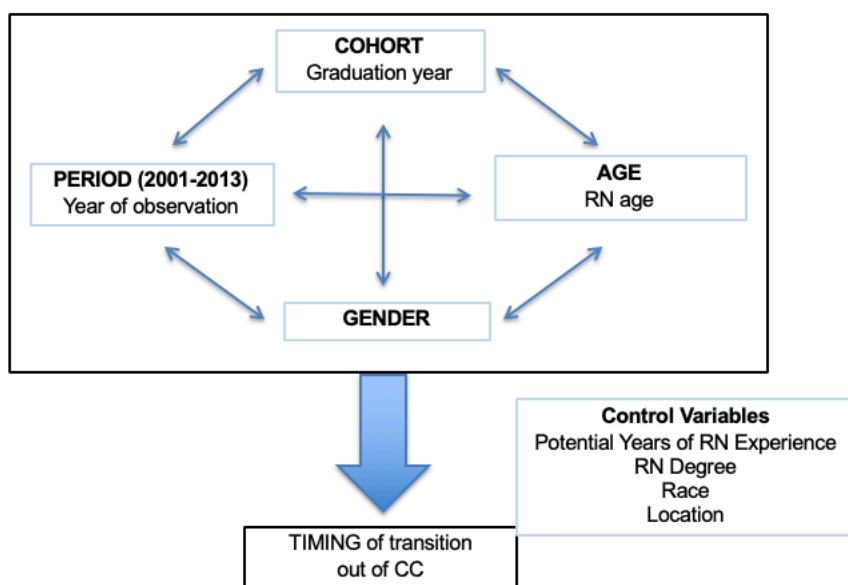
Conceptual Model and Hypotheses

This dissertation used LCT to guide this study of transitions in the nursing workforce, specifically examining RN transitions out of the CC specialty or the RN workforce. In this study of RNs, a work transition was signaled by the transition of a CC RN into a different specialty or out of the active nursing workforce, influenced by their demographics and the time period in which they are working, shared and experienced similarly by others in their social cohort, and affected by their biological age. In keeping with the literature review of LCT and work transitions, this dissertation explored the intersections of these period, cohort, age, and gender effects on the timing and likelihood of CC RN transitions. In this conceptual model, as shown in Figure 2.2., CC RN transitions were conceptualized as being influenced by:

- i. The historical *period*, or the distinctive historical, social, and cultural events experienced by CC RNs of given ages and cohorts that describe the larger society (and economic and work structures) in which they were situated;
- ii. CC RN graduation *cohort*, or the aggregate of CC RNs who have graduated, entered the labor market, and experienced the same historical events or changes to nursing practices and structures;

- iii. CC RN *gender*, or the differences between men and women between transitions and along their work histories;
- iv. CC RN *age*, as represented by their biological age at the year of observation; and
- v. Control variables, including *years of RN experience*, *nursing degrees*, *race*, and *geographic location*.

Figure 2.2 Conceptual Model for Critical Care Registered Nurse Transitions



Hypotheses about CC RN Transitions

Aside from Jones (2017), this dissertation research was one of the first studies to empirically test the relationships between LCT predictors and RN work transitions. Studies of specialty transitions, the effects of age and gender on RN attrition, and LCT predictors on work transitions were used to generate hypotheses for this dissertation. This dissertation tested hypotheses about specialty transitions during times of recession (period effects) and examined the effects of graduation year (cohort effects), biological age (age effects), and gender (gender effects) on the likelihood and timing of RN transitions out of CC. These hypotheses, presented in

accordance with Figure 2.2 and informed by the literature review of LCT, work transitions, and RN work transitions are described in further detail below.

Period Effects: The Effects of Economic Recessions on RN Transitions

Economic downturns affect workers not only by increasing their risks of unemployment but also by exacerbating their personal and professional issues and creating financial insecurities about the future (Frone, 2018). In nursing, studies have suggested that RNs, particularly those who are older and have experience, were more likely to work during the Recession than in other years because of anticipated spousal job losses and financial insecurities (Buerhaus et al., 2009; Tellez et al., 2013; Yoo et al., 2017). However, there is a gap in the literature about how economic recessions affect specialty transitions and whether more specific RN workforces, such as the CC RN workforce, are similarly affected. Therefore, the following hypotheses about CC RNs will be tested:

H₁: Smaller proportions of CC RN specialty transitions will occur during the Recession (2007-2009) than in other years of the study period.

H₅: CC RNs who began working during the Recession (2007-2008) are more likely to remain in CC for longer periods of time than those who began working in CC prior to the Recession.

Cohort Effects: The Effects of Graduation Year on RN Transitions

This review of the literature identified no studies that examined differences between cohorts of RNs who graduated in earlier versus more recent years, and how RNs' transition behaviors might be affected by changes to healthcare delivery, nursing education, and clinical practice. However, LCT literature emphasizes the importance of examining cohort effects and, with respect to work, suggests that more contemporary careers may be characterized by more

change and flux than traditional hierarchical structures (e.g., working for and advancing within the same hospital until retirement). In the last decade, the nursing profession has been called on to make changes to its education and practice structures, such as instituting residency training and increasing the percentage of RNs with BSNs to 80% by 2020, to support a growing and aging population and increased demand for healthcare (Institute of Medicine [IOM], 2011; Jones, 2017; Spetz, 2018; Warshawsky, Brandford, Barnum, & Westneat, 2015). Anticipated increases in primary care utilization and the shift of patient care from hospitals to outpatient settings has created new opportunities for RNs who had been traditionally employed in hospitals or are just entering the labor market (Hofer, Abraham, & Moscovice, 2011). Because of these increased opportunities, CC RNs who graduated in more recent years may view their job as a “stepping-stone” to obtain RN experience before pursuing these more available advanced practice roles. Therefore, RNs entering the workforce in more recent years, relative to those in earlier cohorts, may have greater exposure to, access to, and higher preferences for non-hospital work, and they may be more likely to make transitions out of CC to fit their needs. To capture these cohort differences in the nursing workforce, graduation cohorts (or more specifically, the year in which RNs complete nursing school and qualify for licensure) will be used to compare the effects of graduating in an earlier versus a later period in time. The following hypotheses will be tested:

H₃: CC RNs who graduated from their entry-level nursing programs in more recent (i.e., later) years of the study period are more likely to transition out of CC than those who graduated in earlier years.

H₆: CC RNs who graduated from their entry-level nursing programs in more recent years of the study period are less likely to remain in CC for longer periods of time than those who graduated longer times ago.

Age Effects on RN Transitions

Studies of RN work transitions found that age was a significant predictor of transitions but findings about its effects were inconsistent (Alameddine et al., 2009; Holmas, 2002; Nooney et al., 2010). Studies of work transitions in other industries suggest that younger workers, particularly those between the ages of 15 and 24, were more prone to make transitions in their search to find a good person-job fit (Lyons et al., 2012; Topel & Ward, 1992; Super, 1957; Vuolo et al., 2012). Older workers, in general, were found to be more likely to value and maintain stable work lives that were not characterized by frequent change. Therefore, the following hypotheses about the effects of age on CC RN transitions will be tested:

H₂: As the age of CC RN at first entry to CC increases, CC RNs become less likely to make a transition.

H₇: As the age of CC RN at first entry to CC increases, nurses are more likely to remain in CC for longer periods of time than those of younger ages.

Gender Effects on RN Transitions

Finally, studies guided by LCT have highlighted the importance of examining the effects of gender on work transitions. Male RNs have been found to be more likely to make transitions out of nursing and have shorter tenures in nursing. Therefore, the following hypotheses were tested:

H₄: Male CC RNs are more likely to make transitions than female CC RNs.

H₈: Male CC RNs are less likely to remain in CC for longer periods of time than female CC RNs.

Chapter Summary

Chapter 2 defined key terms and reviewed relevant literature on LCT and how it has been applied to studies of work. The effects of the key LCT constructs of period, cohort, age, and gender were discussed including how they interact to affect the timing of individuals' transitions. A review of the literature on work and work transitions was also presented, with a focus on studies of RN specialty transitions. Two recently published reviews of the literature on RN specialty transitions (see Ashley et al., 2016; Kinghorn et al., 2017) highlighted the need for further research in this area, particularly for workforce planners and policymakers who would benefit from knowledge about the characteristics and predictors of RNs who make transitions to address specialty area workforce needs and improve workforce capacity. This dissertation builds on these prior literatures and introduces LCT to studies of the CC RN workforce and RN transitions. The chapter ended with a presentation of the conceptual model and hypotheses, informed by LCT, that address the aims of this dissertation. The methods for this dissertation research are presented in Chapter 3.

CHAPTER 3. METHODS

This dissertation study was guided by LCT, employing methods to analyze individual persons' "event histories", or sequences of domain-specific work and social statuses that may or may not change over time (Giele & Elder, 1998). A secondary, retrospective cohort analysis using annual data from 2001 through 2013 from the North Carolina (NC) Health Professions Data System for Registered Nurses (HPDS-RN) was conducted to examine the transitions of RNs out of CC. Because there were no national datasets to examine CC RNs over time, these state-level licensure data were important in understanding work and specialty transitions of the CC RN workforce.

This analysis of CC RNs in NC was used to determine how LCT-informed variables (namely the Recession¹¹, RN licensure/graduation cohort, age, and gender) jointly affected the occurrence and timing of CC RN transitions out of the CC specialty. This study examined CC RNs who have either retained their active CC specialty practice, made a specialty transition out of CC to another specialty, or made a transition out of the active NC CC workforce during the study period (2001-2013). Therefore, a transition out of the NC CC RN workforce occurred in one of two ways: 1) *specialty transition*, or when RNs actively practicing in CC reported a change out of CC and into a different clinical specialty area (e.g., not CC and possibly a missing value); and 2) *attrition*, or when CC RNs did not remain actively licensed and practicing in NC for the entire study period (i.e., drop out of the active NC RN workforce).

¹¹ Recession, capitalized, refers specifically to the Great Recession that occurred in the U.S. and in national economies globally between 2007 and 2009.

The primary study aims of this study were to:

Aim 1a: Describe the educational, demographic, geographic, and practice characteristics of the CC RN workforce in NC between 2001 and 2013.

Aim 1b: Describe the occurrences and types of CC RN specialty transitions that occur in the NC CC RN workforce between 2001 and 2013.

Aim 2: Examine the likelihood that RNs will make a transition out of CC, and the key variables from LCT that affect the transition.

Aim 3: Determine how key variables from LCT impact longer times that CC RNs stay in CC before making a transition out of CC.

Descriptive analyses, logistic regression, Poisson regression, and ordinal regression were used to address these study aims and determine the degree to which factors from LCT contribute to CC RN patterns of transition and retention in the actively practicing NC CC workforce.

Data

Through a collaboration between health professions licensing boards and the Cecil G. Sheps Center for Health Services Research (hereafter, the Sheps Center) at the University of North Carolina (UNC) at Chapel Hill, the state of NC has a rich database of the healthcare workforce (Fraher & Jones, 2011). The North Carolina Health Professions Data System (NCHPDS) is maintained at the Sheps Center and includes data on all RNs licensed to practice in NC. The data were unique in that they were a complete census of the workforce and contained individual-level data on RNs, beginning with their initial NC licensure obtained through the North Carolina Board of Nursing (NCBON). Nurses' data were updated every two years when they were relicensed by the NCBON. Half of NC RNs renewed their license each year according to their birth month. Therefore, each RN licensed to practice in NC had a bi-annual record in the

HPDS-RN, and RNs maintained the same RN license number as long as they were licensed in NC. The annual files from the NCBON allowed for analyses of changes to the demographic, practice, education, and geographic characteristics of the NC RN workforce. The NCHPDS audited the data and sought corrections from the NCBON when needed. Time-invariant predictors (e.g., date of birth, sex, or year qualified for licensure) were compared across records, imputed, and/or cleaned so that the full set of data could be used in our analyses. Out of range variables, corrections, and other issues that arose with these data were changed to missing and/or corrected by the researchers before analysis.

Nurse licensure data in NC had been used for a number of analyses, such as to examine educational transitions of RNs to higher degrees (Jones, 2017; Bevill et al., 2007) and transitions of licensed practical nurses (LPNs) to RN licensure (Jones, Toles, Knafl, & Beeber, 2018). These rich data offered a unique opportunity to study the CC RN workforce and how it has changed over time.

Sample

The sample for this dissertation was created from RN licensure data extracted from the NC HPDS-RN that was used for a prior study funded by the National Council of State Boards of Nursing (NCSBN) (Jones, 2017). The study sample consisted of RNs who: 1) maintained active licensure some time during 2001-2013; and 2) identified CC as their primary employment specialty at least once from 2001 to 2013. More recent years of licensure data (after 2013) were available, but key variables needed to examine CC RN transitions were changed in 2014 and complicated the creation of a longitudinal data file. Therefore, to avoid changes that occurred in the way the specialty data were collected and, more importantly, to focus on a period of time that was of particular interest in this study, the latest time period used for sample selection was 2013.

Annual RN data were linked to form a concatenated dataset and to create a longitudinal dataset that reflected a “history” of employment for each CC RN throughout the time they were observed in the study, beginning with the first year they were observed to be in CC. To ensure that the study sample included observations of these CC RNs in their first CC years, RNs who also identified being in CC in 2000 were dropped from the study sample. Work histories were used to model the effects of predictors on the occurrence and timing of transitions out of the NC CC RN workforce; therefore, analyses for this dissertation followed CC RNs prospectively after the first year that they were observed to be in active practice in CC in NC to determine if and when they made a future transition during the study period. Additional sample restrictions were closely linked to study aims and analyses, and these inclusion/exclusion details are discussed in further detail in the Data Analysis section of this chapter.

Measurement

This section describes the specific dependent and independent variables that were examined in this study. These variables were selected based on LCT and were used in model analyses discussed later in the chapter.

Dependent Variables

Two primary outcome variables were used in this study: 1) the occurrence of a transition out of CC (dichotomous variable); and 2) longer versus shorter times remaining in CC (i.e., larger or smaller numbers of years until a transition occurs) (ordinal variable). A secondary outcome variable, the discrete counts of transition events, was used for the analysis of the rates of CC transitions per year. Length of time remaining in CC was defined as an ordinal variable because updates to RN licensure records occurred biennially and thus, had a finite number of possible values and was not a true continuous variable. Creating these two primary outcome

events required that several steps be taken to limit the sample. Transitions were either dichotomous outcome variables (e.g., no transition = 0, transition = 1) or ordinal variables that represented the numbers of years that had lapsed, from lower to higher values, before the transition occurred (i.e., 1-2, 3- 4, and 5 or more years). Analyses were conducted to 1) identify the effect of predictors on the likelihood of transition, and 2) identify the effect of predictors on the longer times that RNs remain in CC. These analyses are discussed in further detail in a later section.

Independent Variables

Drawing on the LCT literature review presented in Chapter 2, models were developed to describe the sample, identify key LCT variables of interest, and conduct analyses to address study aims. Predictors of the occurrence of and longer times until a transition out of the NC CC RN workforce included traditional LCT factors – i.e., period, cohort, age, and gender -- which were used to create comparison groups. Time-varying predictors (e.g., years of RN experience, highest nursing degree, employment location, work setting, and full-time versus part-time) were categorized based on what each RN reported in the first year they were observed to be in CC and were control variables in models. A summary of all variables included in this study is provided in Table 3.1, and predictor variables are described below:

- **Period effects.** Period effects reflected a person’s socio-historical “location” and were defined as the first year during the study period that an RN was observed in CC (i.e., observation year). This variable ranged from 2001-2013 and was considered continuously (with and without a squared term), and categorically, by using indicator (“dummy”) variables for each year between 2001 to 2013 or as Recession versus non-

Recession, in analyses (e.g., 2007, 2008, and 2009 coded as 1 for Recession, all other years coded as 0).

- **Cohort effects.** Cohort effects reflected the shared events and experiences of groups of individuals (cohorts) and were constructed by using the year in which an RN graduated from nursing school and qualified for RN licensure (i.e., graduation cohort). To conduct a more thorough assessment of the effect of graduation cohort on transition outcomes, graduation cohort was considered as both a continuous variable (with and without a squared term), and also as a categorical variable in 10-year groupings, approximate quartile splits, and approximate tertile splits.
- **Age effects.** Age effects reflected how individuals progressed through their working years and was calculated by subtracting the RN's reported date of birth from the first year that the RN was observed in CC, that is, the biological age in which the RN was first observed to be in CC. This variable was constructed similarly as described for graduation cohort, continuously, with and without a squared term, and in 10-year age groupings, approximate quartile splits, and approximate tertile splits. Additionally, the biological ages of CC RNs who transition were described for the year in which they transition.
- **Gender effects.** In LCT, gender effects reflected potential differences and inequalities that may have been present for women throughout different stages of their working lives. They were defined here as a binary variable, based on nurses' responses to an item in the annual licensure file where they identified themselves as either male or female. Gender was coded as an indicator variable for being male.

In addition to these LCT variables, the following additional variables were included and controlled for:

- **Years of RN experience.** This continuous variable was a proxy for years in practice and reflected the total number of years a RN could have worked as an RN. It was calculated by subtracting the year in which the RN graduated from basic nursing education and qualified for RN licensure from the year in which the RN was first observed to be in CC. Years of RN experience was considered in bivariate models and was included as a control variable in regression models separately, because it was a combined measure (and alternate representation) of the year qualified for licensure and first observed year in CC.
- **Educational degree.** This variable reflected an RN's educational preparation at the time they were first observed in CC. The degree that qualified the RN for licensure (i.e., their professional "entry degree") and their highest nursing degree had the potential to be different, so both variables were constructed and compared. Educational degree variables were categorized into diploma, ADN, BSN, and masters or higher.
- **Race.** A RN's race was self-reported in the annual licensure file and coded in the HPDS-RN as: White, Black, Asian, American Indian, Hispanic, and other races. Due to sparse numbers and preliminary analyses of regression coefficients that indicated that American Indian, Hispanic, and other race categories had similar effects on transition outcomes, this variable was reduced to four categories because of these empirical findings. Thus, the final race categories included were: White, Black, Asian, and other races.

- **Location.** RNs residing in rural and urban areas was based on the zip code of the RN's address of employment and metropolitan versus nonmetropolitan (i.e., "rural") definitions provided by the Federal Office of Management and Budget Core Based Statistical Areas.

Table 3.1 Variables Table

Dependent Variables		
	Transition out of NC CC RN workforce (either by specialty transition or attrition)	Dichotomous [yes=1, no=0]
	Longer time in active NC CC RN workforce	Ordinal, 1-2, 3-4, 5 or more
Independent Variables		
Period effects	First year observed in CC	Continuous Categorical, by year Categorical, Recession versus non-Recession
Cohort effects	Graduation cohort	Continuous Categorical, by 10-year groups, approximate quartile or tertile splits
Age effects	Biological age in first observed year in CC	Continuous Categorical, by 10-year groups, approximate quartile or tertile splits
Gender effects	Gender	Categorical [female, male]
Control	Educational degree (entry and highest)	Categorical [diploma, associate, BSN, masters or higher]
	Race	Categorical [White, Black, Asian, and other]
	Location	Categorical [rural, urban]

¹Because of sparse numbers and similar coefficients, American Indian, Hispanic, and Other were used in one category for analysis

Continuous Versus Categorical Variables

First year observed in CC, RN licensure year, age, and years of RN experience were tested in separate models as either continuous or categorical variables. Treating these variables as continuous allowed for the examination of the effects of unit changes, for example, an additional year of age, on the likelihood of transition or on longer times in CC. Squared terms were also included to address potential non-linearity in a continuous predictor. Coding continuous

variables into multiple indicator variables (e.g., age coded in 10-year intervals), however, allowed for assessment of effects of different age groups compared to one reference group. Using the continuous variable had the advantage of being more parsimonious but can also be too simplistic. A categorical variable made the model more complex but can account for general non-linear effects.

Reference Levels

Reference levels for predictors such as sex, race, and employment location were selected based on the most common characteristics of CC RNS (e.g., female, White, employed in urban areas). For predictors of time and age, such as first year in CC, age in first year, and year qualified for licensure, the earliest or youngest groups were chosen as reference levels. Because of the focus on BSN education at organizational and state workforce levels, BSN degrees were chosen as the reference level for both basic nursing (i.e., entry-level) and highest nursing degree variables.

Missing Data

Missing or unknown values for study variables were identified and coded separately. While it would be possible to drop all observations with missing data for any variable in the model, using this approach would have resulted in a large reduction in sample size. The alternative approach used was to treat missing as another possible value for a variable. For categorical variables, this involved creating a separate categorical value/level for missing values, allowing missing values to have their own effect on the outcome. For continuous variables, missing values were reset to zero values and a variable was created to indicate whether a variable value was missing (1=missing, 0= observed) (Knafl, Toles, Beeber, & Jones, 2018; Friedman, 1991).

Such missing value adjustments were considered in bivariate regression models to allow for possible missingness effects (Knafl, Toles, Beeber, & Jones, 2018; Friedman, 1991). If adjustments were significant, they were also included in multivariate regression models. Otherwise they were dropped from further consideration, thereby treating them as zero for continuous variables and combining them with the reference category for categorical variables. Doing so allowed for the use of the full sample in all analyses.

Protection of Human Subjects

Approval to access de-identified data was obtained from the Institutional Review Board (IRB) at UNC at Chapel Hill via a modification to the parent study examining educational transitions and trajectories of NC RNs. After dissertation committee approval, approval to use data for this analysis was obtained by the NCBON, and an IRB application for this specific study was obtained from the UNC IRB. This approval was obtained prior to beginning data analysis.

Data Management

Data analyzed in this study were stored on a password-protected laptop with automated operating system management, anti-virus controls, and firewall configuration. Scheduled and automatic backups were taken to protect against data loss or theft. Data were extracted according to the sample guidelines and imported to SAS Version 9.4 for coding and analysis (SAS Institute, Inc., Cary, NC). Data were maintained on a UNC IRB-approved and secure server and will be removed and deleted after this study has been closed with the IRB, as per UNC IRB regulations.

Data Analysis

To determine the occurrence of a transition out of CC required first identifying RNs who reported working in CC at any point between 2001 and 2013, a sub-sample of RNs was created from the larger NCBON dataset. The annual records of all active RN licensees were combined and linked, by RN licensure numbers, to form a concatenated dataset that followed individual RNs over time. This formed a longitudinal “record” (i.e., work history) of employment for each CC RN throughout the time each RN was observed to be working in CC during the study period. Then, these longitudinal records were then used for analyses of specialty and other transitions out of CC. The analysis for this dissertation was focused in the following three areas, each discussed below to correspond to the specific aims of the study.

Aim 1a

Describe the educational, demographic, geographic, and practice characteristics of the CC RN workforce in NC between 2001 and 2013.

To address this aim, a descriptive analysis of unique RNs in NC who were active at least once between 2001-2013 in the larger NC HPDS-RN sample was used to determine the percentage of the NC RN workforce that was comprised of CC RNs. The CC RN sample consisted of those unique RNs who identified CC as their primary employment specialty in any year(s) between 2001 and 2013. Descriptive statistics (frequencies and percentages) were used to present the characteristics (e.g. transition year(s), graduation cohort, age, gender, years since RN licensure, academic degree(s), race, number of transitions) of the CC RN workforce, annually and total, during the 2001-2013 period. The frequency and percentages of missing values, for each variable, were also determined.

To create RN transition variables, RN data between 2001-2013 were categorized in one of three ways: Group 1 included RNs who were observed in CC, and did not make a transition from CC during the study period (i.e., RNs who remained in the CC specialty); Group 2 represented RNs who were observed to transition out of CC and into another non-CC or missing specialty area (i.e., specialty transition); and Group 3 represented RNs “leavers” from the NC workforce (i.e., became inactive or did not renew nursing licensure in NC) (see Table 3.2). CC RNs were categorized and separated based on the *first* transition that they reported making between 2001 and 2013. For those RNs who made multiple and/or different types of transitions throughout the study period, only data for the year in which this first observed transition occurred were used for modeling and analyses. For example, if an RN was observed to be in CC in 2002, work in public health in 2004, and not renew their license in 2006, the observation was categorized as having made a specialty transition. Group 1 was the reference group to which RNs in the other two groups were compared.

Table 3.2 Registered Nurse Transition Categorizations

Group	Variable Name	Description
Group 1	No transition	NC RNs who report working in CC at any point between 2001-2013 and remain actively working in CC in subsequent years during the study period
Group 2	Specialty transition	NC RNs who work in CC at any point between 2001-2013 and later report actively working in a specialty other than CC (possibly a missing value) at least once during the study period
Group 3	Attrition from the NC RN workforce	NC RNs who work in CC at any point between 2001-2013 and do not maintain active RN licensure in NC in at least one year of the study (i.e., RNs may be licensed in another state, retired from the workforce, or for whatever reason report being “inactive”)

Aim 1b

Describe the occurrences and types of transitions that occur in the NC CC RN workforce between 2001 and 2013.

To address this aim, the subset of those RNs who made *specialty* transitions (Group 2 in Table 3.2) were analyzed separately to describe the specialties to which CC RNs make specialty transitions, the years in which transitions occur, the ages of RNs when they are first observed in CC, and the ages of RNs when a transition was made. Poisson regression methods were used to compare the numbers of CC RN specialty transitions made during the Recession versus other years between 2001 and 2013. Poisson regression was used because the outcome consisted of discrete counts of transition events for individual years. An indicator variable for Recession years was included as an independent variable in a regression model. The natural logs of the mean counts of transitions per year were then modeled in terms of the indicator of Recession year or not. An offset variable based on the numbers of CC RNs per year was included in the model to convert this to a model for the mean rate of CC transitions per year. This process enabled testing of the following hypothesis:

H₁: Smaller proportions of CC RN specialty transitions will occur during the Recession (2007-2009) than in other years of the study period.

Aim 2

Examine the likelihood that RNs will make a transition, by testing relationships among key variables from LCT.

To address Aim 2, a sub-sample of those RNs who identified CC as their primary employment specialty at least once during the period of 2001-2008 were used to ensure that CC RNs would have at least five possible years of data during which a transition could have

occurred. These RNs were coded 1 for the primary outcome of the study to indicate having made a transition out of CC (either by specialty transition to a non-CC specialty or transition to inactive/non-licensure status); the primary outcome was coded as 0 for the RNs who did not make transitions. Using this 2001-2008 CC RN sub-sample, logistic regression was used to examine the effects of key variables from LCT (period, cohort, age, and gender effects) and control variables (potential years as an RN, educational degree, race, and location) on the likelihood of making a transition out of CC. Bivariate logistic regression models were used to ascertain the individual effects of each LCT and control predictor on the likelihood of transition out of the NC CC RN workforce. Missing values were included for these predictors, and the bivariate models were used to determine whether or not missing values affected the transition outcome. Using these bivariate logistic regression models, the following hypotheses were tested:

H₂: As the age of CC RN at first entry to CC increases, CC RNs become less likely to make a transition.

H₃: CC RNs who graduated from their entry-level nursing programs in more recent (i.e., later) years of the study period are more likely to transition out of CC than those who graduated in earlier years.

H₄: Male CC RNs are more likely to make transitions than female CC RNs.

All predictor variables were then included and tested to fit a composite (main effects) model to examine the influence of LCT variables on the likelihoods of transition and to determine if statistically significant predictors from bivariate model testing remained significant ($p < .05$) after adjusting for the influence of other predictors. Separate composite effects models were generated to accommodate variables that were similar to one another (e.g., RN experience and year qualified for licensure; RN licensure degree and highest nursing degree) and alternate

categorizations of variables (e.g., continuous, approximate quartile or tertile splits, or 10-year period categorizations). To account for any time period-specific shocks during the period (i.e., time effects), the first year that the CC was observed to be in CC was also included in models as either a continuous variable or as a categorical year variable. The model selection process is described in further detail in the next section.

Model Selection

To determine which variables and categorizations of variables were better predictors of transition, Akaike information criterion (AIC) scores were calculated and compared for all models. The AIC is an estimator of out-of-sample prediction error and evaluates the model's fit on the data by using the model's maximum likelihood estimation (log likelihood), with a penalty term for higher parameter complexity of the model. AICs can be used to compare the relative quality of statistical models for a given set of data (Heinze, Wallisch & Dunkler, 2018; Sclove, 1987). Model selection consisted of 1) identifying variable categorizations with the lowest AIC scores in single-predictor models, and then 2) composite models with the lowest AIC scores to maintain high parsimony and to determine whether hypotheses still held after controlling for other variables.

Aim 3

Determine how key variables from LCT impact longer times CC RNs remain in CC before making a transition.

To address this aim, ordinal regression models were used to evaluate the effects of predictor variables on longer times that RNs remain as CC. The outcome of interest – the longer times in the NC CC RN workforce – was a ranked, ordered (and not continuous) variable because RNs could only report data biennially. These are proportional odds models generating

odds ratios for RNs spending longer times compared to shorter times in the three time-categories (1-2, 3-4, and 5 or more years), rather than addressing specific time lengths. Licensure data were analyzed to determine the first year that an RN was observed to work in CC and the period of time that they remained in CC before a transition occurred. Using data from 2001-2008 allowed CC RNs to be observed for at least five years in the dataset; every CC RN in the sample could have any one of the three outcome values, which enabled an evaluation of relationships between LCT and longer time periods that CC RNs remained in CC. Ordinal regression models examined the effects of key variables from LCT (period, cohort, age, and gender effects) and control variables on this transition outcome.

The hypothesis testing and model selection approaches were similar to that described in Aim 2. Hypothesis tests, including determining the significance of missing values, were conducted for bivariate models. Time period-specific shocks during the study period were investigated by including the first year that the CC RN was observed in CC, testing year as both a continuous and a categorical variable. Using the bivariate ordinal regression models, the following hypotheses were tested:

H₅: CC RNs who began working during the Recession (2007-2008) are more likely to remain in CC for longer periods of time than those who began working in CC prior to the Recession.

H₆: CC RNs who graduated from their entry-level nursing programs in more recent years of the study period are less likely to remain in CC for longer periods of time than those who graduated longer times ago.

H₇: As the age of CC RN at first entry to CC increases, nurses are more likely to remain in CC for longer periods of time than those of younger ages.

H₈: Male CC RNs are less likely to remain in CC for longer periods of time than female CC RNs.

In subsequent multivariate models, all LCT and control variables were included, after adjusting for the influence of any LCT predictors that were statistically significant in bivariate models remained so in composite models. Variables that were similar to one another and alternate categorizations of variables were used to generate separate multivariate models that were compared and selected by their AIC scores (see previous ‘Model Selection’ section).

Additional Analyses

To further explore the effects of age and gender on CC RN transitions, several additional analyses were conducted. First, transition outcomes were separated into specialty and inactive/non-licensure transitions, and then modeled separately in both logistic and ordinal regression models following the same analysis process. Doing so allowed for a comparison of the effects of LCT predictors on these two different types of transitions, and findings from these analyses could be used to guide future research.

Additionally, to address the shift of healthcare workers from hospitals to non-hospital areas and to further explore the effects of age on specialty transitions, logistic regression models of the likelihood of transition to public/community health and outpatient areas (versus other specialty areas that are typically situated within hospitals) were analyzed. For those CC RNs who made specialty transitions, an outcome variable for public health and community health or outpatient areas versus other specialty areas was created. The outcome was coded based on the specialties and/or settings to which CC RNs made transitions (see Table 3.3).

Table 3.3 Coding of Specialty and Setting Areas

Variables and Coding	Specialty Areas / Settings
Public/community health and outpatient (coded as 1)	Specialties: public/community health Settings: hospital outpatient; long-term care; solo/group practice; HMO/insurance company; home care/hospice; public health/health department; mental health; student health site; industry/manufacturing; private duty
Hospital inpatient and other (coded as 0)	Specialties: general practice; geriatrics; obstetrics; gynecology; medical/surgical; pediatrics; psychiatric mental health; acquired immunodeficiency syndrome (AIDS); cardiology; critical care; dermatology; dialysis; drug/alcohol; otolaryngology; emergency care; family health; neonatal; neurology; occupational health; oncology; orthopedics; peri-operative; rehabilitation; transplants; urology; “other” Settings: hospital inpatient; school of nursing/medicine; “other”

Limitations

The limitations of this study, especially the use of secondary data, must be acknowledged. First, omitted variable bias could be present since these data were collected for primarily administrative and regulatory purposes, and not specifically for this analysis. Therefore, the dataset does not contain all of the variables needed for a full and complete analysis of LCT. Several important LCT variables (e.g., marital status and family structure variables) were not collected and thus not included in analyses to examine their effects. Nevertheless, study analyses included key LCT available, so that knowledge can be advanced regarding the CC RN workforce and predictors of RN transitions.

Second, there was possible error in the actual year in which a CC RN transition occurred, as RNs are only required to update their data every two years and do so voluntarily. The ordinal variable for longer times in CC was created to account for this error; for example, the categories included 1-2, 3-4, and 5 or more years in CC. In any case, these data were mostly complete, and it is reasonable to assume that respondents generally provide accurate data.

Finally, this study examined transitions in a CC RN sample from only one state. Therefore, the generalizability of these findings is limited and study findings must be cautiously considered. This limitation will be discussed in further detail in Chapter Five.

Chapter Summary

Chapter Three presented the study methods that were built on the literature review gaps and conceptual framework described in previous chapters. This dissertation research used relevant methods to conduct a retrospective cohort analysis of RNs in NC from 2001-2013. The goal of this project was to understand the transition behaviors of RNs out of the CC specialty. Using variables derived from LCT and prior RN workforce studies, this study tested and identified relationships for specific LCT variables (e.g., period, cohort, age, and gender effects) and additional control variables (e.g., potential years of RN experience, educational degree, and race) with RN specialty transitions and transitions out of the NC CC workforce. Descriptive analyses, Poisson regression, logistic regression, and ordinal regression were used to address study aims and determine the degree to which factors from LCT contribute to CC RN patterns of transition and retention in the NC CC workforce. The findings of this dissertation research are reported in Chapter Four.

CHAPTER 4. RESULTS

This chapter provides the results of this dissertation's analyses. The chapter is organized by aim. For Aim 1, tables and figures are provided that describe the characteristics of the CC RN workforce, the occurrence and characteristics of CC RN transitions, and the rates of transition in Recession versus non-Recession years. Tables are provided for Aims 2 and 3 that describe the sample used in the analysis, including the results of individual effects analysis (i.e., bivariate regression models), and the results of composite effects analysis (i.e., final selected regression models). Finally, additional analyses, and a summary of findings are presented at the end of the chapter. Table 4.1 provides an overview of the study samples and sub-samples used in this dissertation analysis.

Table 4.1 Study Samples and Sub-Samples

Sample	Sample size	Description
NC HPDS-RN	n=129,058	Uniquely licensed RNs in NC from 2001-2013
2001-2013 CC RN sample	n=12,969	Uniquely licensed, active NC RNs who identify CC as their primary employment specialty from 2001-2013
2001-2008 CC RN sub-sample	n=8,408	Uniquely licensed, active NC RNs who identify CC as their primary employment specialty from 2001-2008
Specialty transition	n=3,860	CC RNs who made specialty transitions to a non-CC or missing specialty at least once between 2001-2008, and directly from their first year in CC
<i>Public/community health, outpatient</i>	<i>n=1,379</i>	CC RNs who made specialty transitions to public/community health and outpatient areas
Inactive/non-licensure transition	n=2,615	CC RNs who either moved to inactive status or did not renew licensure at least once from 2001-2008, and directly from their first year in CC
No transition	n=1,933	RNs who remained in CC from their first year as a CC RN and throughout the duration of the study period

Aim 1a

Describe the characteristics of the CC RN workforce in NC between 2001 and 2013.

In NC, the number of licensed, actively practicing RNs increased annually from 2001 to 2013, with the annual number of RNs ranging from 74,790 (in 2001) to 99,611 (in 2013) RNs (see Figure 4.1). In each of these years, CC was the third most frequently reported specialty in the RN sample (after medical/surgical and “other” specialties, respectively). The CC RN workforce also increased annually from 2001 to 2013, representing approximately 6-7% of all licensed, actively practicing RNs in NC actively working in CC in each year of the study period (see Figure 4.2; Table 4.2). The distribution of various characteristics in the CC RN workforce – such as age, gender race, urban versus rural employment location, and highest nursing degree – remained relatively consistent in each year of the study period (see Appendix C).

Figure 4.1. Numbers of Licensed, Actively Practicing Registered Nurses in North Carolina, 2001-2013

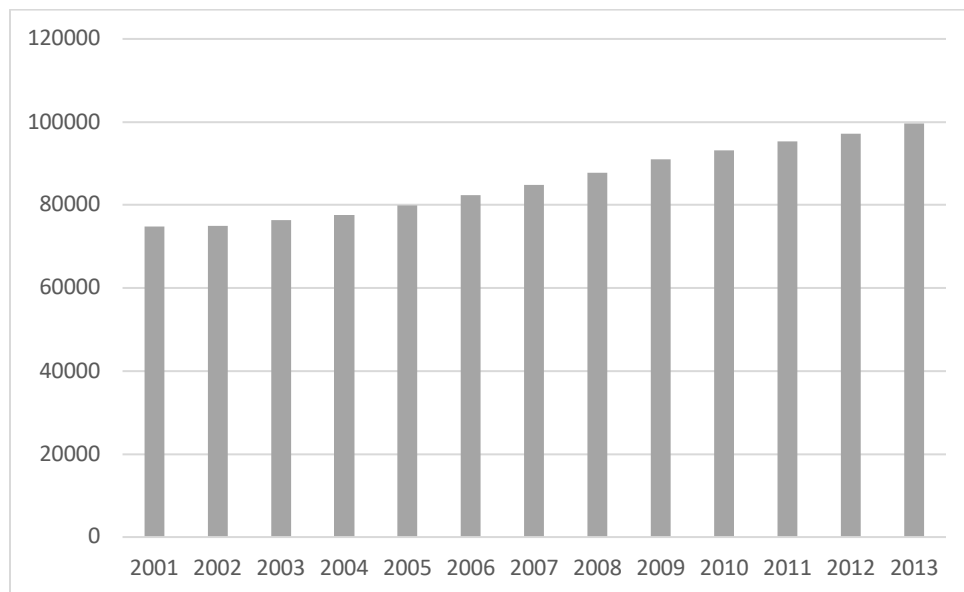


Figure 4.2. Numbers of Licensed, Actively Practicing Critical Care Registered Nurses in North Carolina, 2001-2013

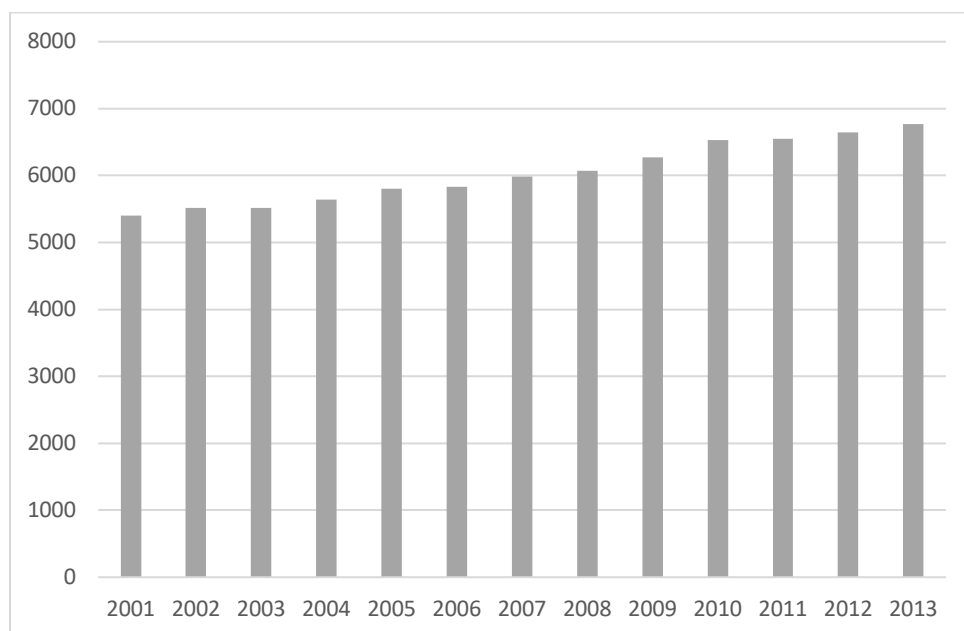


Table 4.2 Numbers of Licensed, Actively Practicing Critical Care and Total Registered Nurses (RNs) in North Carolina, 2001-2013

Year	Numbers of RNs n	Numbers of RNs in Critical Care n (% ¹)
2001	74,790	5,404 (7.2)
2002	74,971	5,516 (7.4)
2003	76,334	5,513 (7.2)
2004	77,655	5,642 (7.3)
2005	79,835	5,803 (7.3)
2006	82,303	5,829 (7.1)
2007	84,820	5,983 (7.1)
2008	87,743	6,067 (6.9)
2009	90,930	6,271 (6.9)
2010	93,133	6,527 (7.0)
2011	95,335	6,549 (6.9)
2012	97,222	6,647 (6.8)
2013	99,611	6,767 (6.8)

¹Percentage of RN workforce in that year

The sample for this study was comprised of unique RNs who identified CC as their primary employment specialty in any year(s) between 2001 and 2013, and who did not report being in CC in 2000 (n=12,969). As shown in Table 4.3, this CC RN sample was primarily female (85.4%), White (83.3%), employed in urban areas (84.7%), employed full-time (90.7%), and worked in an inpatient hospital setting (96.8%). The ages of CC RNs in this sample, in the

Table 4.3 Characteristics of North Carolina Critical Care Registered Nurses, 2001-2013

Variable	n (%) ¹	Variable	n (%) ¹
Gender		Employment location	
Male	1,890 (14.6)	Urban	10,982 (84.7)
Female	11,078 (85.4)	Rural	1,707 (13.2)
Missing	1 (0.0)	Missing	280 (2.2)
Race/Ethnicity		Work setting	
White	10,803 (83.3)	Hospital inpatient	12,552 (96.8)
Black	1,172 (9.0)	Hospital outpatient	94 (0.7)
American Indian	110 (0.9)	Community-based	93 (0.7)
Hispanic	189 (1.5)	Other	229 (1.8)
Asian	463 (3.6)	Missing	1 (0.0)
Other	208 (1.6)	Employed full time	
Missing	24 (0.2)	Full-time	11,766 (90.7)
Age in CC, in years		Part-time	1,192 (9.2)
Under 25	2,032 (15.7)	Missing	11 (0.1)
25-29	3,158 (24.4)	RN licensure degree	
30-39	4,399 (33.9)	Diploma	1,131 (8.7)
40-49	2,413 (18.6)	Associate	6,662 (51.4)
50-59	880 (6.8)	BSN	5,057 (39.0)
60+	70 (0.5)	MSN, other	6 (0.1)
Missing	17 (0.1)	Missing	113 (0.9)
RN experience, in years		Year qualified for licensure	
2 or fewer	1,400 (10.8)	Before 1970	75 (0.6)
3-5	5,513 (42.5)	1970-1979	486 (3.8)
6-9	2,227 (17.2)	1980-1989	1,309 (10.1)
10-19	2,466 (19.0)	1990-1999	3,684 (28.4)
20 or more	1,335 (10.3)	2000-2009	6,474 (50.0)
Missing	28 (0.2)	2010 or later	916 (7.1)
Highest nursing degree		Missing	25 (0.2)
Diploma	794 (6.1)	Age at licensure, in years	
Associate	5,815 (44.8)	21 and younger	1,121 (8.6)
BSN	6,018 (46.4)	22-25	5,485 (42.3)
MSN, doctorate	336 (2.6)	26-29	2,416 (18.6)
Missing	6 (0.1)	30-39	2,989 (23.1)
		40-49	825 (6.4)
		50+	98 (0.8)
		Missing	35 (0.3)

¹percent missing out of a total n=12,969 critical care registered nurses

first year they were observed in CC, ranged from 18 to 63 with a mean age of 33.9 years (SD=9.1).

Additionally, CC RNs had an average of 8.3 (SD=7.6) years of RN experience when they were first observed in CC (see Table 4.4). The majority of the sample had qualified for RN licensure between 2000-2009 (50.0%), had received an associate degree in nursing (ADN) as their first nursing degree (51.4%), and were 25 years of age or younger in the year of licensure (50.9%). With the exception of employment location, which was missing for 2.2% of the CC RN sample, at least 99% of data were complete in the HPDS for these key study variables.

Table 4.4 Characteristics of North Carolina Critical Care Registered Nurses, 2001-2013

Variable	n ¹	Mean	SD	Min	Max	25 th percentile	Median	75 th percentile
Age, in years ²	12,952	33.9	9.1	20.0	64.0	26.0	32.0	40.0
RN experience, in years	12,941	8.3	7.6	2.0	47.0	3.0	5.0	11.0
Age at licensure, in years	12,934	27.6	6.7	18.0	63.0	23.0	25.0	31.0

¹Out of a total n=12,969 critical care registered nurses

²Age first observed in critical care

Aim 1b

Describe the occurrences and types of CC RN transitions that occur out of the NC CC RN workforce between 2001 and 2013.

To address Aim 1b, the occurrences and types of CC RN transitions out of the active NC CC RN workforce between 2001 and 2013 were calculated (see Table 4.5). As described in Chapter Three, two types of transitions were identified: 1) transitions out of CC and into a different or missing specialty area, and 2) transitions to inactive or non-licensure status. Because RNs could have made more than one transition throughout the study period, transitions were categorized based on the *first* transition they were observed to have made.

Table 4.5. Occurrences of Critical Care Registered Nurse (CC RN) Transitions, 2001 to 2013

Year	Number of CC RNs ¹	Specialty Transitions n (%)	Inactive/Non-Licensure n (%)	Total CC RN Transitions n (%)
2002	5,516	230 (4.2)	206 (3.7)	436 (7.9)
2003	5,513	291 (5.3)	217 (3.9)	508 (9.2)
2004	5,642	338 (6.0)	287 (5.1)	625 (11.1)
2005	5,803	267 (4.6)	224 (3.9)	491 (8.5)
2006	5,829	389 (6.7)	299 (5.1)	688 (11.8)
2007	5,983	387 (6.5)	272 (4.6)	659 (11.0)
2008	6,067	449 (7.4)	261 (4.3)	710 (11.7)
2009	6,271	450 (7.2)	239 (3.8)	689 (11.0)
2010	6,527	410 (6.3)	280 (4.3)	690 (10.6)
2011	6,549	416 (6.4)	301 (4.6)	717 (11.0)
2012	6,647	462 (7.0)	321 (4.8)	783 (11.8)
2013	6,767	431 (6.4)	253 (3.7)	684 (10.1)
Totals		4,520	3,160	7,680

¹The numbers of CC RNs that are reported here represent the number of RNs who reported CC as their specialty area of practice, in each year. There were a total of n=12,969 unique CC RNs in this sample.

The CC RN workforce was observed to be quite mobile in terms of transitioning out of CC and transitioning out of the NC RN workforce. Of the 12,969 CC RNs in the sample between 2001 and 2013, more than a third of CC RNs (n=4,520) were observed to transition to another specialty area, and nearly a quarter (n=3,160) of the CC RN sample became inactive or non-licensed. Less than half of the CC RN sample (n=5,289) remained in CC, or made no transition, during the study period. There were 2,486 (19.7%) CC RNs in this sample who were licensed as RNs for all 13 years of the study period; the remaining CC RNs in this sample received their licensure in a more recent year and/or left the RN workforce in some year throughout the study period.

Figure 4.3 depicts the occurrences of both CC RN specialty and attrition transitions separately, and in combination, relative to the total CC RN workforce each year. Interestingly, both specialty transition and attrition transition occurrences follow relatively the same patterns

until 2006. In that year, just before the Recession, the proportion of specialty transitions in the CC RN workforce increased until 2008; however, the proportion of transitions to inactive status in the CC RN workforce steadily decreased until 2009.

Figure 4.3. Percentages of Critical Care Registered Nurse Workforce Transitions, 2001 to 2013

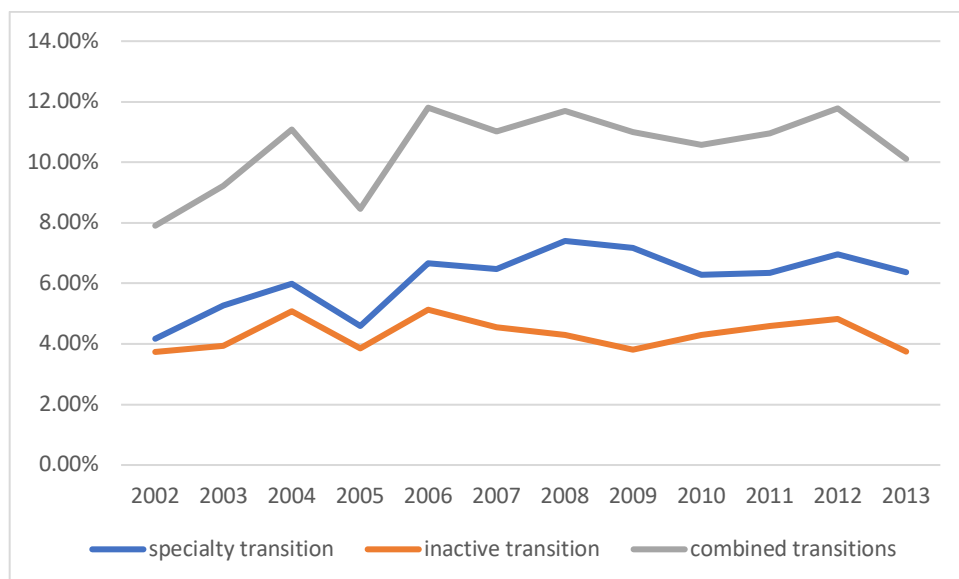


Table 4.6 presents the characteristics of CC RNs *after* making a specialty transition to a non-CC area. Of those 4,520 CC RNs observed to have made specialty transitions, 1,237 (27.4%) reported working in “other” specialty areas¹², 573 (12.5%) in emergency, 497 (11.0%) in peri-operative care, and 463 (10.2%) in cardiology. These CC RNs who made a transition out of CC primarily reported working in hospital inpatient settings and urban areas, being between 30-39 years of age, and had a mean of 8.1 years of RN experience and 3.4 years of CC experience in the first year observed to be working in a non-CC area. There was a higher

¹² “Other” was a survey option that RNs could self-identify and select in their response.

Table 4.6 Characteristics of Critical Care Registered Nurses in the Year of Observed Specialty Transition, 2001-2013 (n=4,520)

Variable	Specialty Transition n (%)
Age at transition, in years (Mean $\pm$ SD)	38.8 $\pm$ 9.2
<29	976 (21.6)
30-39	1,772 (39.2)
40-49	1,202 (26.6)
50-59	498 (11.0)
60+	72 (1.6)
Missing	0 (0.0)
RN experience at transition, in years (Mean $\pm$ SD)	8.1 $\pm$ 3.0
Less than 5	1,218 (27.0)
6-9	1,285 (28.4)
10-19	1,287 (28.5)
20+	722 (16.0)
Missing	8 (0.2)
CC experience, in years¹ (Mean$\pm$SD)	3.4 $\pm$ 2.2
1-2	2,400 (53.1)
3-5	1,287 (28.5)
6-9	724 (16.0)
10+	109 (2.4)
Missing	0 (0.0)
Highest nursing degree	
Diploma	269 (6.0)
Associate	1,818 (40.2)
BSN	1,919 (42.5)
MSN, doctorate	514 (11.4)
Missing	269 (6.0)
Specialty area²	
“Other” ³	1,237 (27.4)
Emergency Care	563 (12.5)
Cardiology	463 (10.2)
Peri-operative	497 (11.0)
Medical/surgical	406 (9.0)
Public/community health	236 (5.2)
General practice	234 (5.2)
Geriatrics	136 (3.0)
Pediatrics	94 (2.1)
OB/GYN	489 (2.0)
Missing	12 (0.3)
Setting	
Hospital inpatient	2,632 (58.3)
Hospital outpatient	382 (8.5)
Community-based	969 (21.4)
Other	536 (11.9)
Missing	1 (0.0)
Employment location	
Rural	729 (16.1)
Urban	3,760 (83.2)
Missing	31 (0.7)

¹CC experience refers to the number of years the RN is first observed to be in CC in NC during the study period. This number does not account for any CC or non-CC experience prior to this, or the possibility of being in CC during multiple separate times from 2001-2013. ²The ten most commonly occurring specialty areas are reported here. Other specialties included: psychiatric mental health, AIDS, dermatology, dialysis, drug/alcohol, otolaryngology, family health, neonatal, neurology, occupational health, orthopedics, rehabilitation, transplant, and urology. ³“Other” was a survey option that RNs could select for specialty area.

proportion of RNs who made a transition with a MSN degree or higher, relative to RNs with these degrees in their first years in CC (11.4% versus 2.6%; refer to Table 4.6 and Table 4.3).

The Effects of Recession on Rates of CC RN Transitions

Poisson regression was used to test a hypothesis about whether the rate of CC RN transition to specialty, inactive, and combined transitions out of the active NC CC RN workforce in Recession years was lower than non-Recession years. Due to the small sample size of 13 years, only the effect of Recession years (2007-2009) versus non-Recession years was considered, and the distribution of characteristics in the RN workforce (e.g., gender, race, RN licensure degree, highest nursing degree, and location) were not included in the models.

Table 4.7 presents the results of this Poisson regression analysis. The hypothesis that fewer specialty transitions occurred during Recession years was not supported. In actuality, the rate of specialty transitions increased in Recession years compared to non-Recession years, but this finding was not significant ($p=.058$). Additional models were analyzed for RNs who made a transition to inactive and non-licensure statuses and for RNs who made either of these types of transitions. The rate of transition to inactive status and to either non-CC specialty or inactive status in Recession years was also not significant ($p=.683$ and $p=.246$, respectively).

Table 4.7 Poisson Regression Results

		Estimate	SE	Wald 95% CI		P
Specialty transition	Intercept, β_0	-2.8298	.0488	-2.9255	-2.7342	<.001
	Recession Year, β_1	0.1733	.0915	-0.0060	0.3527	.058
Inactive/non-licensure transition	Intercept, β_0	-3.1331	.0408	-3.2130	-3.0532	<.001
	Recession Year, β_1	-0.0337	.0825	-0.1953	0.1279	.683
Transitions out of active, NC CC RN workforce	Intercept, β_0	-2.2769	.0404	-2.3561	-2.1977	<.001
	Recession Year, β_1	0.0906	-.0780	-0.0624	0.2435	.246

Aim 2

Examine the likelihood that RNs have made a transition, by testing relationships among key variables from LCT.

The second objective of this study was to examine the likelihood that CC RNs have made a transition out of CC, and the key LCT variables that affect those transitions. To allow enough time (e.g., at least five years) to observe the occurrence of a CC RN transition, the CC RN sample was reduced to a sub-sample that consisted of RNs whose first years observed in CC were between 2001 and 2008 (n=8,408). Analysis indicated that 3,860 RNs made a specialty transition out of CC and 2,615 RNs became inactive or did not renew their license between 2001-2008. Less than a quarter of the RNs in this sample (n=1,933) did not make a transition during the study period. Table 4.8 presents the characteristics of the nurses that made no transition, a specialty transition, or transitioned to inactive/non-licensure groups in both the full CC RN sample and 2001-2008 subsample. The CC RNs in each of these groups were primarily female, White, and on average of 34 to 35 years of age in their first year in CC. Additionally, RNs across all groups primarily reported having an ADN or BSN degree as their highest nursing degree, being employed in an urban setting, between the ages of 22 and 25 at the time of RN licensure and qualified for RN licensure during the study period.

Logistic regression models were used to ascertain the effects of four LCT variables (first year in CC, graduation cohort, age, and gender) and five additional variables (RN licensure degree, highest RN degree, years of RN experience, race, and location) to test hypotheses on the likelihood that CC RNs have made transitions out of the active, NC CC RN workforce. To allow enough time (e.g., at least five years) to observe the occurrence of a CC RN transition, the CC RN sub-sample that consisted of RNs whose first years observed in CC were between 2001 and

Table 4.8 Characteristics of Critical Care Registered Nurses Who Did and Did Not Transition out of the Active North Carolina Critical Care Registered Nurse Workforce, 2001 to 2013

	No transition		Specialty transition		Inactive transition	
	2001-2013 sample (n=5,289)	2001-2008 sub-sample (n=1,933)	2001-2013 sample (n=4,520)	2001-2008 sub-sample (n=3,860)	2001-2013 sample (n=3,160)	2001-2008 sub-sample (n=2,615)
Gender						
Male	803 (15.2)	290 (15.0)	534 (11.8)	455 (11.8)	553 (17.5)	459 (17.6)
Female	4,486 (84.8)	1,643 (85.0)	3,986 (88.2)	3,405 (88.2)	2,606 (82.5)	2,155 (82.4)
Missing	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.0)	1 (0.0)
Race						
White	4,327 (81.8)	1,596 (82.6)	3,850 (85.2)	3,304 (85.6)	2,626 (83.1)	2,192 (83.8)
Black	474 (9.0)	167 (8.6)	436 (9.7)	364 (9.4)	262 (8.3)	212 (8.1)
American Indian	56 (1.2)	12 (0.6)	32 (0.7)	29 (0.8)	22 (0.7)	18 (0.7)
Hispanic	89 (1.7)	29 (1.5)	42 (0.9)	31 (0.8)	58 (1.8)	39 (1.5)
Asian	232 (4.4)	92 (4.8)	109 (2.4)	89 (2.3)	122 (3.9)	103 (3.9)
Other	103 (2.0)	34 (1.8)	51 (1.1)	43 (1.1)	54 (1.7)	40 (1.5)
Missing	8 (0.2)	3 (0.2)	0 (0.0)	0 (0.0)	16 (0.5)	11 (0.4)
Age in CC, in years (Mean $\pm$ SD)	33.3 $\pm$ 9.0	34.3 $\pm$ 8.9	34.4 $\pm$ 9.0	34.6 $\pm$ 8.9	34.1 $\pm$ 9.5	34.5 $\pm$ 9.5
Under 25	941 (17.8)	288 (14.9)	647 (14.3)	520 (13.5)	444 (14.1)	325 (12.4)
25-29	1,345 (25.4)	416 (21.5)	983 (21.8)	832 (21.6)	830 (26.3)	665 (25.4)
30-39	1,722 (32.6)	702 (36.3)	1,626 (36.0)	1,394 (36.1)	1,051 (33.3)	899 (34.4)
40-49	932 (17.6)	391 (20.2)	958 (21.2)	851 (22.1)	523 (16.6)	451 (17.3)
50-59	326 (6.2)	130 (6.7)	280 (6.2)	236 (6.1)	274 (8.7)	240 (9.2)
60+	18 (0.3)	5 (0.3)	22 (0.5)	19 (0.5)	30 (1.0)	26 (1.0)
Missing	5 (0.1)	1 (0.1)	4 (0.1)	8 (0.2)	8 (0.3)	9 (0.3)
First observed year in CC						
2001-2003	526 (10.0)	526 (27.2)	1,958 (43.3)	1,958 (50.7)	1,367 (43.3)	1,367 (52.3)
2004-2006	671 (12.7)	671 (34.7)	1,197 (26.5)	1,197 (31.0)	784 (24.8)	784 (30.0)
2007-2009	1,172 (22.2)	736 (38.1)	1,031 (22.8)	705 (18.3)	687 (21.7)	464 (17.7)
2010+	2,920 (55.2)	--	334 (7.4)	--	322 (10.2)	--
Missing	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
RN experience, in years (Mean $\pm$ SD)	7.6 $\pm$ 7.3	8.8 $\pm$ 7.9	8.8 $\pm$ 7.8	9.1 $\pm$ 7.8	8.7 $\pm$ 7.7	9.0 $\pm$ 7.7
1-2	630 (11.9)	207 (10.7)	482 (10.7)	409 (10.6)	288 (9.1)	236 (9.0)
3-5	2,513 (47.5)	766 (39.6)	1,744 (38.6)	1,419 (36.8)	1,256 (39.8)	967 (37.0)
6-9	837 (15.8)	310 (16.0)	797 (17.6)	700 (18.1)	593 (18.8)	515 (19.7)
10-19	817 (15.5)	416 (21.5)	965 (21.4)	854 (22.1)	684 (21.7)	600 (22.9)
20+	489 (9.3)	234 (12.1)	523 (11.6)	469 (12.2)	323 (10.2)	281 (10.8)
Missing	3 (0.1)	0 (0.0)	9 (0.2)	9 (0.2)	16 (0.5)	16 (0.6)

Table 4.8 (continued)

	No transition		Specialty transition		Inactive transition	
	2001-2013 sample (n=5,289)	2001-2008 sub- sample (n=1,933)	2001-2013 sample (n=4,520)	2001-2008 sub- sample (n=3,860)	2001-2013 sample (n=3,160)	2001-2008 sub- sample (n=2,615)
Highest nursing degree						
Diploma	242 (4.6)	126 (6.5)	311 (6.9)	293 (7.6)	241 (7.6)	229 (8.8)
Associate	2,486 (47.0)	1,001 (51.8)	2,128 (47.1)	1,799 (46.6)	1,201 (38.0)	1,017 (38.9)
BSN	2,433 (46.0)	777 (40.2)	1,945 (43.0)	1,657 (42.9)	1,640 (51.9)	1,302 (49.8)
MSN, doctorate	126 (2.4)	29 (1.6)	136 (3.0)	111 (2.9)	78 (2.5)	65 (2.5)
Missing	2 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	4 (0.1)	2 (0.1)
Employment location						
Rural	702 (13.3)	236 (12.2)	659 (14.6)	561 (14.5)	346 (11.0)	287 (11.0)
Urban	4,546 (86.0)	1,663 (86.0)	3,746 (82.3)	3,186 (82.5)	2,690 (85.1)	2,207 (84.4)
Missing	41 (0.8)	34 (1.8)	115 (2.5)	113 (2.9)	124 (3.9)	121 (4.6)
Year qualified for licensure						
Before 1970	17 (0.4)	9 (0.5)	33 (0.7)	23 (0.6)	50 (1.5)	34 (1.8)
1970-1979	128 (2.4)	97 (5.0)	235 (5.2)	220 (5.7)	123 (3.9)	116 (4.4)
1980-1989	348 (6.6)	211 (10.9)	595 (13.2)	563 (14.6)	366 (11.6)	339 (13.0)
1990-1999	970 (18.3)	636 (32.9)	1,548 (34.3)	1,456 (37.7)	1,166 (36.9)	1,097 (42.0)
2000-2009	2,936 (55.5)	979 (50.7)	2,095 (46.4)	1,586 (41.1)	1,443 (45.7)	1,014 (38.8)
2010 or later	890 (16.8)	--	14 (0.3)	--	12 (0.4)	--
Missing	0 (0.0)	1 (0.1)	0 (0.0)	12 (0.3)	0 (0.0)	17 (0.6)
Age at licensure, in years (Mean $\pm$ SD)	27.7 $\pm$ 6.8	27.5 $\pm$ 6.4	27.6 $\pm$ 6.6	27.5 $\pm$ 6.6	27.5 $\pm$ 6.5	27.6 $\pm$ 6.6
21 and younger	415 (7.9)	176 (9.1)	440 (9.7)	385 (10.0)	266 (8.4)	234 (9.0)
22-25	2,283 (43.2)	819 (42.4)	1,849 (40.9)	1,577 (40.9)	1,353 (42.8)	1,079 (41.3)
26-29	980 (18.5)	352 (18.2)	809 (17.9)	691 (17.9)	627 (19.8)	520 (19.9)
30-39	1,202 (22.7)	472 (24.4)	1,096 (24.3)	938 (24.3)	691 (21.9)	585 (22.4)
40-49	363 (6.9)	101 (5.2)	279 (6.2)	229 (5.9)	183 (5.8)	161 (6.2)
50+	42 (0.8)	12 (0.6)	31 (0.7)	25 (0.7)	25 (0.8)	21 (0.8)
Missing	4 (0.1)	1 (0.1)	16 (0.4)	117 (2.6)	15 (0.5)	74 (2.9)
RN licensure degree						
Diploma	338 (6.4)	167 (8.6)	459 (10.2)	422 (10.9)	334 (10.6)	308 (11.8)
Associate	2,825 (53.4)	1,085 (56.1)	2,446 (54.1)	2,067 (53.6)	1,391 (44.0)	1,180 (45.1)
BSN	2,074 (39.2)	651 (33.7)	1,586 (35.1)	1,344 (34.8)	1,397 (44.2)	1,097 (42.0)
MSN, other	3 (0.1)	1 (0.1)	2 (0.0)	1 (0.0)	1 (0.0)	0 (0.0)
Missing	49 (0.9)	29 (1.5)	27 (0.6)	26 (0.7)	37 (1.2)	30 (1.2)

2008 was used for analysis. The characteristics of these RNs were similar to those described in the larger CC RN sample: CC RNs were primarily female, White, between the ages of 30 and 39 in their first year in CC, with 3-5 years of RN experience in their first year in CC, had BSN or ADNs as their highest nursing degrees, were employed in urban areas, and qualified for licensure during the study period (2000-2008) (Table 4.9). On average, CC RNs were 34.5 years old and had 9 years of RN experience in their first year in CC (Table 4.10).

Table 4.9 Characteristics of Pooled, Concatenated North Carolina Critical Care Registered Nurse Sub-Sample used in Logistic Regression Analysis (n=8,408)

Variable	n (%)	Variable	n (%)
Gender		Employment location	
Male	1,204 (14.3)	Rural	1,084 (12.9)
Female	7,203 (85.7)	Urban	7,056 (83.9)
Missing	1 (0.0)	Missing	268 (3.2)
Race/Ethnicity		Work setting	
White	7,092 (84.4)	Hospital inpatient	8,108 (96.4)
Black	743 (8.8)	Hospital outpatient	66 (0.8)
American Indian	59 (0.7)	Community-based	64 (0.8)
Hispanic	99 (1.2)	Other	169 (2.0)
Asian	284 (3.4)	Missing	1 (0.0)
Other	117 (1.4)	Employed full time	
Missing	14 (0.2)	Full-time	7,517 (89.4)
Age in CC, in years		Part-time	886 (10.5)
Under 25	1,133 (13.5)	Missing	5 (0.1)
25-29	1,913 (22.8)	RN licensure degree	
30-39	2,995 (35.6)	Diploma	897 (10.7)
40-49	1,693 (20.1)	Associate	4,332 (51.5)
50-59	606 (7.2)	BSN	3,092 (36.8)
60+	50 (0.6)	MSN, other	2 (0.0)
Missing	18 (0.2)	Missing	85 (1.0)
RN experience, in years		Year qualified for licensure	
2 or fewer	852 (10.1)	Before 1970	66 (0.8)
3-5	3,152 (37.5)	1970-1979	431 (5.2)
6-9	1,525 (18.1)	1980-1989	1,113 (13.2)
10-19	1,870 (22.2)	1990-1999	3,189 (37.9)
20 or more	984 (11.7)	2000-2008	3,579 (42.6)
Missing	25 (0.3)	Missing	30 (0.4)
Highest nursing degree		Age at licensure, in years	
Diploma	648 (7.7)	21 and younger	795 (9.5)
Associate	3,817 (45.4)	22-25	3,475 (41.3)
BSN	3,736 (44.4)	26-29	1,563 (18.6)
MSN, doctorate	205 (2.4)	30-39	1,995 (23.7)
Missing	2 (0.0)	40-49	491 (5.8)
		50+	58 (0.7)
		Missing	31 (0.4)

Table 4.10 Characteristics of Pooled, Concatenated North Carolina Critical Care Registered Nurse Sub-Sample used in Logistic Regression Analysis (n=8,408)

Variable	n	Mean	SD	Min	Max	25 th percentile	Median	75 th percentile
Age in CC, in years	8,390	34.5	9.1	20.0	64.0	27.0	33.0	41.0
RN experience, in years	8,383	9.0	7.8	2.0	44.0	3.0	6.0	12.0
Age at licensure, in years	8,377	27.5	6.5	19.0	58.0	23.0	25.0	31.0

Table 4.11 shows the number of CC RNs in the sub-sample by age of first observed year in CC, RN licensure cohort, and gender. Because CC RNs were only observed from 2001-2008, not all cohorts included RNs in each age group. For example, because CC RNs could not qualify for RN licensure before the age of 18 years, CC RNs could not have qualified for RN licensure before 1970, between 1970 and 1979, or between 1980 and 1989 and been younger than 30 in their first year in CC in the study period. There were small sample sizes (n<50) for men who qualified for RN licensure before 1970, between 1970 and 1979, or between 1980 and 1989. With the exception of females who were 50 or older in their first years in CC, there were small sample sizes (n<50) for females who qualified for RN licensure before 1970.

Table 4.11 Age, Gender, and Registered Nurse (RN) Licensure Year of Critical Care RNs in North Carolina, 2001-2008

RN Licensure Cohort	<30 years of age		30-39		40-49		50+		Total
	Male	Female	Male	Female	Male	Female	Male	Female	
Before 1970	--	--	--	--	--	--	1	63	64
1970-1979	--	--	--	--	11	201	16	200	428
1980-1989	--	--	21	351	42	521	25	151	1,111
1990-1999	113	770	257	1,295	109	501	31	112	3,188
2000-2008	243	1,914	243	825	67	234	21	32	3,579
Total	356	2,684	521	2,471	229	1,457	94	558	8,370

In the primary analysis, CC RNs were considered to have made a transition if they were observed to either 1) have made a specialty transition to a different or missing specialty area, or

2) became inactive during the observation period. Table 4.12 shows the individual effects of each LCT and control variable used in bivariate logistic regression models, on the likelihood of

Table 4.12. Individual Effects of Critical Care Registered Nurse Characteristics on the Likelihood of Transition out of Critical Care (n=8,408)

Variable	Odds Ratio	95% CI	p-value
First year in CC	0.79	0.77-0.80	<.001**
2001	--	--	--
2002	0.97	0.77-1.23	.786
2003	0.74	0.60-0.92	.007**
2004	0.52	0.43-0.64	<.001**
2005	0.47	0.38-0.58	<.001**
2006	0.32	0.27-0.39	<.001**
2007 (Recession year)	0.30	0.25-0.37	<.001**
2008 (Recession year)	0.18	0.15-0.21	<.001**
Missing	n/a	n/a	n/a
Age in CC, in years	1.00	1.00-1.01	.449
29 or younger	--	--	--
30-39	0.98	0.87-1.11	.782
40-49	1.00	0.87-1.15	.988
50-59	1.10	0.89-1.36	.373
60 or older	2.71	1.07-6.8	.036*
Missing	999	0.0-999	.945
Year qualified for licensure	0.98	0.97-0.98	<.001**
Before 1992	--	--	--
1992-1998	1.04	.89-1.21	.618
1999-2002	1.04	0.89-1.22	.606
2003 or later	0.51	0.44-0.59	<.001**
Missing	999	0.0-999	.949
Age at licensure¹	1.00	0.99-1.01	.722
23 or younger	--	--	--
24-28	1.00	0.88-1.14	.954
29 or older	0.98	0.87-1.10	.710
Missing	8.92	1.22-65.42	.031*
RN experience, in years²	1.00	1.00-1.01	.439
3 or less	--	--	--
4-9	1.27	1.12-1.43	<.001**
10 or more	1.15	1.02-1.30	.027*
Missing	999	0.0-999	.945
Gender			
Female	--	--	--
Male	0.93	0.81-1.08	.330
Missing	999	0.0-999	.963
Race			
White	--	--	--
Black	1.00	0.84-1.20	.986
Asian	0.61	0.47-0.78	<.001**
Other	0.77	0.59-1.02	.065
Missing	1.07	0.30-3.82	.923
Employment location			
Urban	--	--	--

Rural	1.11	0.95-1.29	.193
Missing	2.12	1.48-3.05	<.001**
RN licensure degree			
BSN	--	--	--
Diploma	1.17	0.97-1.41	.112
Associate	0.80	0.72-0.89	<.001**
MSN, other	0.27	0.02-4.29	.352
Missing	0.52	0.33-0.81	.004**
Highest nursing degree, in CC			
BSN	--	--	--
Diploma	1.09	0.88-1.34	.432
Associate	0.74	0.66-0.82	<.001**
MSN, doctorate	1.59	1.07-2.38	.023*
Missing	.999	0.0-999	.965

¹ Age at licensure is an alternate categorization of first year in critical care, age in critical care, and year qualified for licensure; ² RN experience is an alternate categorization of year qualified for licensure; *p<.05; **p<.01

transition out of the NC CC RN workforce (by either specialty transition to a non-CC specialty or transition to inactive/non-licensure status). Continuous variables are reported in both their continuous and in the categorical form with the lowest AIC score (refer to Appendix D for details). Comparison of the characteristics of CC RNs shows that the odds of transition were higher for CC RNs who: had more RN experience in their first year in CC than those with less experience (1.27 times if between 4 and 9 years and 1.15 times if 10 or more years, versus 3 or less years); were 60 or older in their first year in CC compared to those 29 or younger (2.71 times); or had an MSN or doctorate as their highest nursing degrees relative to a BSN degree (1.59 times). Conversely, the odds of transition were lower if CC RNs: were first observed in CC in more recent years in the study period (0.79 times for each additional year after 2001); became qualified as RNs after 2003 relative to before 1992 (0.51 times); were Asian relative to White (0.61 times); had an ADN degree at licensure relative to a BSN degree (0.80 times); or had an ADN degree as their highest nursing degree relative to a BSN degree (0.74 times). Missing values for age at licensure, RN licensure degree, and employment location had significant effects on the transition outcome. Age at licensure and gender did not have effects on the transition outcome in these models. All non-significant missing values (i.e., all predictors except age at

licensure, employment location, and RN licensure degree) were combined with reference categories for each predictor.

Squared terms for age in CC (CI 1.00-1.00, $p=.145$), age at licensure (CI 1.00-1.00, $p=.627$), years of experience (CI 1.00-1.00, $p=.790$), and licensure year (CI 1.00-1.00, $p<.001$), were non-significant. Including a squared term with a linear term for age in CC resulted in a significant quadratic term (CI 1.00-1.00 and $p=.036$ for quadratic term; CI 0.93-1.00 and $p=.054$ for linear term). Squared terms and linear terms, combined in models, for all other variables were non-significant.

All LCT predictors and control variables were included in composite (main effects) logistic regression models. Appendix E presents the findings of several models and their associated AIC scores. The model with the lowest AIC score was selected because it reflected a better model fit and is presented in Table 4.12. Because year qualified for licensure was non-significant in this model, models of this variable in its categorization forms were also reviewed to identify whether there were any differences between indicator values (e.g., see Appendix F).

The final selected composite (main effects) model was statistically significant (model $\chi^2(23)=586.9$, $p<.001$) (see Table 4.13). The reference, or “base case” category is the combination of characteristics that occurred most commonly in this sample – CC RNs who were White, female, 29 or younger, and employed in an urban area. For predictors of time, the earliest groups were chosen as reference levels: first observed year in CC in 2001 and an RN licensure year before 1992. BSN was the reference level for highest nursing degree. This final model is summarized below:

$$\begin{aligned} \text{Nurse transition} = & \beta_0 + \beta_1 2002 + \beta_2 2003 + \beta_3 2004 + \beta_4 2005 + \beta_5 2006 + \beta_6 2007 + \beta_7 2008 + \beta_8 1992-1998 + \\ & \beta_9 1999-2002 + \beta_{10} 2003 \text{ or later} + \beta_{11} \text{age } 30-39 + \beta_{12} \text{age } 40-49 + \beta_{13} \text{age } 50-59 + \beta_{14} \text{age } >60 + \beta_{15} \text{male} + \end{aligned}$$

$$\beta_{16}\text{diploma} + \beta_{17}\text{ADN} + \beta_{18}\text{MSN or doctorate} + \beta_{19}\text{Black} + \beta_{20}\text{Asian} + \beta_{21}\text{other race} + \beta_{22}\text{rural} + \beta_{23}\text{location missing} + \varepsilon$$

As shown in Table 4.13, three of the LCT predictor variables and two of the control variables in the composite (main effects) model were significantly related to the likelihood of a CC RN transition. These results were similar to those in the bivariate models with one notable exception: when controlling for other effects, instead of decreasing the odds of transition, RNs who qualified for licensure in more recent years had higher odds of transitioning out of CC relative to those in earlier years (1.36 times for RNs in 1999 through 2002 and 1.35 times for RNs in 2003 or later, relative to RNs before 1992). Those RNs who were 60 or older, relative to those 29 or younger, were 3.21 times more likely to transition out of CC or the workforce when controlling for other effects. Gender and rural versus urban employment location remained non-significant in this model.

Table 4.13 Composite Effects of Critical Care Registered Nurse Characteristics on Transitions out of Critical Care (n=8,408)

Variable	Odds Ratio	95% CI	p-value
First year in CC			
2001	--	--	--
2002	0.92	0.73-1.17	.511
2003	0.71	0.57-0.89	.003**
2004	0.49	0.40-0.61	<.001**
2005	0.44	0.35-0.55	<.001**
2006	0.30	0.24-0.37	<.001**
2007 (Recession year)	0.28	0.23-0.35	<.001**
2008 (Recession year)	0.16	0.13-0.20	<.001**
Year qualified for licensure			
Before 1992	--	--	--
1992-1998	1.18	0.99-1.40	.054
1999-2002	1.36	1.12-1.66	.001**
2003 or later	1.35	1.08-1.67	.006**
Age in CC, in years			
29 or younger	--	--	--
30-39	1.02	0.89-1.17	.820

40-49	1.06	0.89-1.28	.501
50-59	1.28	0.99-1.67	.062
60 or older	3.21	1.24-8.54	.018*
Gender			
Female	--	--	--
Male	0.92	0.79-1.07	.282
Highest nursing degree, in CC			
BSN	--	--	--
Diploma	0.87	0.70-1.09	.231
Associate	0.67	0.60-0.75	<.001**
MSN, doctorate	1.56	1.02-2.35	.036*
Race			
White	--	--	--
Black	1.03	0.84-1.23	.838
Asian	0.62	0.47-0.82	.001**
Other	0.90	0.68-1.20	.471
Employment location			
Urban	--	--	--
Rural	1.15	0.97-1.35	.099
Missing	1.28	0.85-1.80	.207

*p<.05; **p<.01

Aim 3

Determine how key variables from LCT impact longer times that CC RNs remain in CC before making a transition.

The third objective of this study was to determine how key variables from LCT influenced longer times that CC RNs remained in CC before making a transition. Ordinal regression models were used to ascertain the effects of four LCT variables (first year in CC, graduation cohort, age, and gender) and five control variables (RN licensure degree, highest RN degree, years of RN experience, race, and location) on the lengths of time that CC RNs remained active in NC and in the CC RN workforce. Similar to the logistic regression models, CC RNs were considered to have made a transition out of the active, NC CC RN workforce if they were observed to either 1) make a specialty transition to missing or a different specialty area, or 2) become inactive during the observation period. The outcome variable consisted of three rank-ordered levels based on the number of years CC RNs were observed to be in the active, NC CC

RN workforce until either a transition occurred or the study period ended (e.g., 2 or less years, 3-4 years, and 5 or more years).

Table 4.14 shows the individual effects of each LCT and control variable, in bivariate ordinal regression models, on the lengths of time CC RNs remained in the active, NC CC RN workforce. Continuous variables are reported in both their continuous and in the categorical form with the lowest AIC score (refer to Appendix G). Squared values for all continuous variables (the first year in CC, age first observed in CC, year qualified for licensure, age at licensure, and RN experience) were non-significant in these models.

Table 4.14 Individual Effects of Critical Care Registered Nurse Characteristics on Longer Times in CC (n=8,408)

Variable	Odds Ratio ¹	95% CI	p-value
First year in CC	1.06	1.04-1.07	<.001**
2001	--	--	--
2002	1.07	0.92-1.24	.365
2003	1.21	1.05-1.40	.010*
2004	1.29	1.19-1.49	.001**
2005	1.20	1.03-1.39	.020*
2006	1.31	1.13-1.52	<.001**
2007 (Recession year)	1.35	1.17-1.56	<.001**
2008 (Recession year)	1.55	1.34-1.80	<.001**
Missing	n/a	n/a	n/a
Age in CC, in years	1.00	1.00-1.00	.656
29 or younger	--	--	--
30-39	0.97	0.88-1.07	.529
40-49	1.04	0.93-1.16	.465
50-59	1.00	0.85-1.18	.970
60 or older	0.51	0.30-0.88	.016*
Missing	1.41	0.46-4.29	.548
Year qualified for licensure	1.00	1.00-1.00	.042*
Before 1992	--	--	--
1992-1998	0.52	0.23-1.15	.998
1999-2002	1.10	0.98-1.23	.108
2003 or later	1.20	1.07-1.35	.002**
Missing			.105
Age at licensure	1.00	1.00-1.01	.426
23 or younger	--	--	--
24-28	0.96	0.87-1.06	.412
29 or older	1.03	0.94-1.14	.486
Missing	0.42	0.21-0.84	.015*
RN experience, in years	1.00	1.00-1.00	.315
3 or less	--	--	--
4-9	0.84	0.76-0.93	<.001**

10 or more	0.88	0.80-0.97	.011*
Missing	0.38	0.17-0.83	.015*
Gender			
Female	--	--	--
Male	1.02	0.91-1.14	.719
Missing	0.0	0.0-999	.943
Race			
White	--	--	--
Black	0.92	0.80-1.05	.217
Asian	1.13	0.90-1.41	.289
Other	1.06	0.85-1.33	.594
Missing	0.63	0.23-1.70	.362
Employment location			
Urban	--	--	--
Rural	0.83	0.74-0.94	.002**
Missing	0.48	0.38-0.61	<.001**
RN licensure degree			
BSN	--	--	--
Diploma	1.03	0.90-1.18	.683
Associate	1.25	1.14-1.36	<.001**
MSN, other	.999	0-.999	.946
Missing	1.38	0.92-2.06	.118
Highest nursing degree, in CC			
BSN	--	--	--
Diploma	1.00	0.86-1.17	.957
Associate	1.33	1.23-1.45	<.001**
MSN, doctorate	0.82	0.63-1.07	.149
Missing	1.12	0.09-14.78	.932

¹Odds ratios are reported in terms of longer versus shorter times in critical care, with a ranked ordinal variable of 5 or more years, 3-4 years, and 2 or less years in critical care

* p<.05; **p<.01

The likelihood of being in CC for longer times was higher for the following CC RNs: whose first years in CC were in more recent years of the study period relative to those in the earlier years (1.06 times); who qualified for RN licensure in 2003 or more recent relative to before 1992 (1.20 times); who had an ADN as at first licensure relative to a BSN degree (1.25 times); or who had an ADN as their highest nursing degree relative to those with a BSN (1.33 times). The likelihood of being in CC for longer times was lower for those CC RNs who were 60 or older relative to those who were 29 or younger (0.51 times), had more than 3 years of RN experience relative to those with 3 or fewer years of experience (0.84 times for those with 4 to 9 years, 0.88 times for those with 10 or more years), or were employed in rural versus urban areas (0.83 times). Additionally, missing values for age at RN licensure, RN experience, and

employment location decreased the likelihood of observing an RN transition. Non-significant missing values (i.e., missing values for age in CC, year qualified for licensure, gender, race, RN licensure degree, and highest nursing degree) were combined with the reference categories for each predictor. Squared terms for all continuous variables were non-significant: age in first year in CC (CI 1.00-1.00, $p=.794$); age at licensure (CI 1.00-1.00, $p=.392$), years of experience (CI 1.00-1.00, $p=.648$), and licensure year (CI 1.00-1.00, $p=.025$). Squared terms and linear terms, combined in ordinal regression models, for all variables were non-significant.

In composite models, first year in CC, in its continuous form, remained significant. Age in CC and year qualified for licensure remained non-significant for both continuous and alternate forms (e.g., 10-year groups, approximate quartile splits, approximate tertile splits) in composite models with other LCT predictors and control variables. Appendix H presents the testing of several models and their associated AIC scores. The model with the lowest AIC score included was selected. Additional models, for example see Appendix I, tested whether first year in CC during or before the Recession was significant and were examined to identify any differences in year qualified for licensure when using indicator variables.

The final selected model (see Table 4.15) was statistically significant (model $\chi^2(15)=146.1$, $p<.001$). The reference, or “base case” category is the combination of characteristics that occurred most commonly in this sample – CC RNs who were White, female, 29 or younger, and employed in an urban area. Predictors of time, both first year in CC and the year the CC RN qualified for RN licensure, were continuous variables. BSN was the reference level for highest nursing degree. This final model is summarized below:

$$\begin{aligned} \text{Longer times in CC} = & \beta_0 + \beta_1 \text{first year in CC} + \beta_2 \text{year qualified for licensure} + \beta_3 \text{age 30-39} + \beta_4 \text{age 40-49} \\ & + \beta_5 \text{age 50-59} + \beta_6 \text{age} > 60 + \beta_7 \text{male} + \beta_8 \text{diploma} + \beta_9 \text{ADN} + \beta_{10} \text{MSN or doctorate} + \beta_{11} \text{Black} + \beta_{12} \text{Asian} \\ & + \beta_{13} \text{other race} + \beta_{14} \text{rural} + \beta_{15} \text{location missing} + \varepsilon \end{aligned}$$

As shown, two of the LCT predictor variables and three control variables in the composite (main effects) models were significantly related to the lengths of time CC RNs remained in CC. These results were similar to those in the bivariate models except that, controlling for other effects, race became a significant predictor of longer times in CC. Controlling for all other effects, those CC RNs whose first years observed in CC were in more recent years of the study period had higher odds of remaining in CC for longer times than those in non-Recession years (1.05 times for each additional year after 2001). Additionally, the odds of remaining in CC for longer time periods were higher for those CC RNs with ADNs compared to those with BSNs as their highest nursing degrees (1.39 times). The odds of remaining in CC for longer time periods was lower for those CC RNs who were employed in rural versus urban areas (0.77 times). Missing values for employment location also decreased the odds of observing CC RNs remaining in CC for longer time periods. With the exception of those RNs 60 or older, age in CC was non-significant in this model. The year qualified for licensure and gender were also non-significant in this model.

Table 4.15 Composite Effects of Critical Care Registered Nurse Characteristics on Longer Times in Critical Care (n=8,408)

Variable	Odds Ratio	95% CI	p-value
First year in CC	1.05	1.03-1.06	<.001**
Year qualified for licensure	1.00	1.00-1.00	.096
Age in CC, in years			
29 or younger	--	--	--
30-39	0.96	0.87-1.05	.367
40-49	1.06	0.94-1.18	.350
50-59	1.02	0.87-1.21	.798
60 or older	0.52	0.30-0.90	.019*
Gender			
Female	--	--	--
Male	1.01	0.90-1.13	.926
Highest nursing degree, in CC			
BSN	--	--	--
Diploma	1.08	0.92-1.26	.363

Associate	1.39	1.27-1.52	<.001**
MSN, doctorate	0.84	0.64-1.10	.198
Race			
White	--	--	--
Black	0.92	0.80-1.06	.234
Asian	1.24	0.99-1.56	.059
Other	1.04	0.83-1.31	.729
Employment location			
Urban	--	--	--
Rural	0.77	0.68-0.87	<.001**
Missing	0.53	0.42-0.68	<.001**

*p<.05; **p<.01

Additional Analyses of LCT Effects

To further explore LCT effects and their effects on different types of CC RN transitions, the transition outcome was categorized into specialty and inactive/non-licensure transitions and then modeled separately. To identify the predictors of remaining in the RN workforce (regardless of specialty) versus transitioning to inactive/non-licensure status, an additional model that included the transition outcome of attrition, or departure from the workforce, versus specialty transition or no transition at all was examined. Table 4.16 presents the results for individual effects of predictors in these logistic regression models and Table 4.18 presents these individual effects for ordinal regression models.

Separate Transition Types: Likelihood of Transition

In the logistic regression models that examined the effect of LCT variables on the likelihood of transition (see Table 4.16), interestingly, gender was found to have different effects in the two separate transition models. Holding all other effects constant, male CC RNs were less likely (0.76 times) to have made a specialty transition versus no transition, but were more likely (1.44 times) to leave the workforce than make a specialty transition or to remain in CC.

For specialty transitions, CC RNs were less likely to transition out of CC if they: were first observed to be in CC in more recent years (0.79 times for each additional year after 2001);

qualified for RN licensure in more recent years of the study period relative to earlier ones (0.50 times if qualifying after 2003 compared to before 1992); had an ADN degree as their highest nursing degree relative to a BSN (0.84 times); or were Asian (0.47 times) or American Indian/Hispanic/Other (0.67 times) relative to White. Age first observed in CC was not a significant predictor of specialty transition. Those RNs who had MSN or doctorate degrees, compared to those with BSNs, were almost twice as likely to have made a specialty transition.

Finally, being employed in a rural area increased the likelihood of CC RNs making a specialty transition out of CC, by 1.24 times. Unlike the specialty transitions model, age was a significant predictor of transition to inactive/non-licensure status. Holding other effects constant, the odds of transition were 1.36 times higher for CC RNs who were between the ages of 50 and 59, and 2.24 times higher for CC RNs who were 60 or older, relative to those who were age 29 or younger. However, CC RNs who were between the ages of 30 and 39 or 40 and 49 in their first year observed in CC were less likely to leave the active RN workforce (by way of transition to inactive or non-licensure status) than their 29 and younger counterparts. Similar to specialty transitions, CC RNs were less likely to transition if their first year in CC was in more recent years of the study period or if they had an ADN relative to a BSN as their highest nursing degrees.

Table 4.16 Individual Effects of Critical Care Registered Nurses Characteristics on Transitions out of Critical Care

Variable	Specialty Transitions versus No Transitions (n=5,793)			Inactive/Non-Licensure Transitions versus No Transitions (n=4,548)			Inactive/Non-Licensure Transitions versus Specialty Transitions/No Transitions (n=8,408)		
	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value
First year in CC	0.79	0.77-0.81	<.001**	0.78	0.76-0.80	<.001**	0.91	0.90-0.93	<.001**
Non-Recession years	--	--	--	--	--	--	--	--	--
Recession years	0.35	0.31-0.40	<.001**	0.35	0.31-0.40	<.001**	0.65	0.58-0.73	<.001**
Year qualified for licensure	0.98	0.97-0.98	<.001**	0.97	0.97-0.98	<.001**	1.00	1.00-1.00	<.001**
Before 1992	--	--	--	--	--	--	--	--	--
1992-1998	1.17	0.99-1.39	.066	1.17	0.99-1.39	.067	1.24	1.09-1.40	.001**
1999-2002	1.07	0.90-1.28	.446	1.07	0.90-1.28	.446	1.07	0.94-1.22	.302
2003 or later	0.50	0.42-0.59	<.001**	0.50	0.42-0.59	<.001**	0.76	0.66-0.87	<.001**
Age in CC, in years	1.00	1.00-1.01	.403	1.00	1.00-1.01	.619	1.00	1.00-1.01	1.00
29 or younger	--	--	--	--	--	--	--	--	--
30-39	1.03	0.91-1.17	.627	0.91	0.79-1.04	.159	0.89	0.80-0.99	.030*
40-49	1.13	0.97-1.31	.111	0.82	0.69-0.96	.016*	0.75	0.66-0.86	<.001**
50-59	0.94	0.75-1.19	.618	1.30	1.03-1.65	.026*	1.36	1.13-1.62	.001**
60 or older	1.97	0.73-5.29	.179	3.67	1.40-9.61	.008**	2.24	1.28-3.92	.005**
RN Experience, in years	1.00	1.00-1.01	.368	1.00	1.00-1.01	.439	1.00	0.99-1.01	.856
3 or less	--	--	--	--	--	--	--	--	--
4-9	1.14	1.00-1.31	.053	1.25	1.10-1.42	.001**	1.31	1.17-1.46	<.001**
10 or more	1.10	0.96-1.25	.171	1.14	1.00-1.28	.043*	1.13	1.01-1.26	.040*
Gender									
Female	--	--	--	--	--	--	--	--	--
Male	0.76	0.65-0.89	<.001**	1.21	1.03-1.42	.022*	1.44	1.27-1.64	<.001**
Highest degree, in CC									
BSN	--	--	--	--	--	--	--	--	--
Diploma	1.80	1.18-2.73	.452	1.08	0.86-1.37	.506	1.02	0.86-1.22	.823
Associate	0.84	0.75-0.95	.004**	0.61	0.54-0.69	<.001**	0.68	0.61-0.75	<.001**
MSN, doctorate	1.80	1.18-2.73	.006**	1.34	0.85-2.09	.204	0.87	0.64-1.17	.353
Race									
White	--	--	--	--	--	--	--	--	--
Black	1.06	0.87-1.28	.587	0.92	0.75-1.14	.451	0.90	0.75-1.05	.166
Asian	0.47	0.35-0.63	<.001**	0.81	0.61-1.08	.159	1.27	0.99-1.62	.061
Other	0.67	0.49-0.90	.008**	0.94	0.69-1.28	.688	1.21	0.94-1.56	.134
Employment location									
Urban	--	--	--	--	--	--	--	--	--
Rural	1.24	1.05-1.46	.010*	0.92	0.76-1.10	.351	0.79	0.69-0.91	.001**
Missing	1.73	1.18-2.56	.005**	2.68	1.82-3.94	<.001**	1.81	1.42-2.31	<.001**

*p<.05; **p<.01

Table 4.17 presents the composite (main effects) effects model with LCT predictors and control variables, used to determine whether these relationships remained significant when controlling for other effects. The reference, or “base case” category is the combination of characteristics that occurred most commonly in this sample – CC RNs who were White, female, 29 or younger, and employed in an urban area. First year in CC was a continuous variable and before 1992 was the reference level for year qualified for RN licensure. BSN was the reference level for highest nursing degree. The final models, for the three different types of transition outcomes, are summarized below:

$$\begin{aligned} \text{Nurse transition} = & \beta_0 + \beta_1 \text{first year in CC} + \beta_2 \text{1992-1998} + \beta_3 \text{1999-2002} + \beta_4 \text{2003 or later} + \beta_5 \text{age 30-39} + \\ & \beta_6 \text{age 40-49} + \beta_7 \text{age 50-59} + \beta_8 \text{age >60} + \beta_9 \text{male} + \beta_{10} \text{diploma} + \beta_{11} \text{ADN} + \beta_{12} \text{MSN or doctorate} + \\ & \beta_{13} \text{Black} + \beta_{14} \text{Asian} + \beta_{15} \text{other race} + \beta_{16} \text{rural} + \beta_{17} \text{location missing} + \varepsilon \end{aligned}$$

In general, the individual effects of predictors on the likelihood of transition did not change in these composite models. However, the effects of RN licensure became non-significant, and the coefficient sometimes changed direction, for different transition outcomes. In this analysis, when controlling for other effects, CC RNs were more likely to have made a specialty transition if they qualified for RN licensure any year after 1999, relative to those who qualified for licensure before 1992. With respect to transition to inactive/non-licensure statuses (versus staying in either CC or transitioning to a different specialty), CC RNs who qualified for licensure in a year between 1992 and 2002, compared to those before 1992, were more likely to have made a transition.

Table 4.17 Composite Effects of Critical Care Registered Nurse Characteristics on Specialty Transitions or Transitions to Non-Licensure or Inactive Status Versus No Transitions

Variable	Specialty Transitions versus No Transitions (n=5,793)			Inactive/Non-Licensure Transitions versus No Transitions (n=4,548)			Inactive/Non-Licensure Transitions versus Specialty Transitions/No Transitions (n=8,408)		
	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value
First year in CC	0.77	0.75-0.80	<.001**	0.78	0.75-0.80	<.001**	0.92	0.90-0.94	<.001**
Year qualified for licensure									
Before 1992	--	--	--	--	--	--	--	--	--
1992-1998	1.02	0.85-1.24	.809	1.42	1.16-1.74	.001**	1.39	1.19-1.61	<.001**
1999-2002	1.30	1.06-1.69	.024*	1.46	1.16-1.85	.001**	1.24	1.04-1.47	.016*
2003 or later	1.10	0.95-1.28	.015*	1.35	1.03-1.76	.030*	1.11	0.90-1.36	.340
Age in CC, in years									
29 or younger	--	--	--	--	--	--	--	--	--
30-39	1.10	0.95-1.28	.196	0.89	0.76-1.05	.156	0.87	0.77-0.98	.021*
40-49	1.18	0.97-1.44	.090	0.88	0.71-1.10	.260	0.80	0.68-0.94	.007**
50-59	1.11	0.84-1.48	.462	1.64	1.22-2.22	.001**	1.57	1.26-1.95	<.001**
60 or older	2.21	0.78-6.30	.134	5.01	1.83-13.76	.002**	2.78	1.54-4.99	.001**
Gender									
Female	--	--	--	--	--	--	--	--	--
Male	0.76	0.64-0.90	.002**	1.18	0.99-1.40	.062	1.41	1.24-1.61	<.001**
Highest degree, in CC									
BSN	--	--	--	--	--	--	--	--	--
Diploma	0.88	0.70-1.11	.314	0.86	0.67-1.11	.249	0.94	0.78-1.12	.488
Associate	0.75	0.66-0.85	<.001**	0.56	0.49-0.65	<.001**	0.69	0.62-0.77	<.001**
MSN, doctorate	1.80	1.16-2.82	.008**	1.28	0.80-2.06	.301	0.87	0.63-1.18	.366
Race									
White	--	--	--	--	--	--	--	--	--
Black	1.10	0.90-1.34	.369	0.87	0.69-1.09	.229	0.88	0.74-1.05	.152
Asian	0.49	0.36-0.67	<.001**	0.80	0.58-1.09	.159	1.24	0.96-1.61	.098
Other	0.74	0.54-1.02	.067	1.09	0.79-1.51	.592	1.27	0.98-1.64	.069
Employment location									
Urban	--	--	--	--	--	--	--	--	--
Rural	1.23	1.03-1.46	.021*	1.01	0.83-1.23	.939	0.86	0.74-1.00	.044*
Missing	0.89	0.59-1.34	.579	1.64	1.09-2.45	.017*	1.63	1.26-2.11	<.001**

*p<.05; **p<.01

Separate Transition Types: Length of Time in CC

Those CC RNs who were first observed to have made a specialty transition or to transition to inactive/non-licensure status were separated into two different sub-samples (refer to Table 4.8 for the descriptive characteristics of these different sub-samples). Single predictor ordinal regression models were then used to examine the effects of LCT predictors and control variables on the lengths of time RNs remained in CC until making either of these types of transition (see Table 4.18).

Table 4.18 Individual Effects of Critical Care Registered Nurses Characteristics on Longer Times in Critical Care until Specialty Transition or Transition to Non-Licensure/Inactive

Variable	Longer Times in CC ¹ Until Specialty Transition (n=3,860)			Longer Times in CC Until Inactive/Non-Licensure Status (n=2,615)		
	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value
First year in CC	0.91	0.88-0.93	<.001**	0.95	0.92-0.98	<.001**
Non-Recession years	--	--	--	--	--	--
During Recession	0.55	0.47-0.67	<.001**	0.75	0.61-0.91	.004**
RN licensure year	1.00	1.00-1.00	.570	1.00	1.00-1.00	.715
Before 1992	--	--	--	--	--	--
1992-1998	1.11	0.94-1.31	.222	1.00	0.82-1.22	.998
1999-2002	1.36	1.15-1.60	<.001**	0.99	0.80-1.22	.937
2003 or later	0.82	0.68-0.97	.022*	0.80	0.64-1.00	.055
Age in CC, in years	0.99	0.98-1.00	.008**	1.01	1.00-1.02	.017
29 or younger	--	--	--	--	--	--
30-39	0.87	0.76-1.00	.049*	1.01	0.85-1.21	.890
40-49	0.89	0.76-1.05	.161	1.28	1.03-1.58	.023*
50-59	0.84	0.65-1.09	.196	1.35	1.03-1.76	.029*
60 or older	0.31	0.11-0.86	.024*	1.22	0.58-2.55	.605
RN Experience, in years	0.99	0.98-1.00	.041*	1.01	1.00-1.01	.317
3 or less	--	--	--	--	--	--
4-9	0.92	0.79-1.06	.023*	0.96	0.80-1.15	.664
10 or more	0.85	0.74-0.98	.247	1.00	0.83-1.21	.987
Gender						
Female	--	--	--	--	--	--
Male	1.10	0.92-1.32	.313	0.96	0.79-1.17	.679
Highest nursing degree						
BSN	--	--	--	--	--	--
Diploma	1.04	0.82-1.31	.756	1.09	0.83-1.43	.529
Associate	1.09	0.96-1.24	.164	1.38	1.18-1.62	<.001**
MSN, doctorate	0.96	0.67-1.39	.839	0.96	0.59-1.56	.861
Race						
White	--	--	--	--	--	--
Black	0.76	0.62-0.94	.010*	1.11	0.85-1.45	.453

Asian	0.93	0.63-1.39	.736	0.73	0.49-1.09	.124
Other	1.08	0.75-1.55	.700	0.80	0.54-1.20	.281
Employment location						
Urban	--	--	--	--	--	--
Rural	0.83	0.70-0.98	.030*	0.71	0.55-0.90	.005**
Missing	0.72	0.50-1.03	.075	0.42	0.28-0.62	<.001**

¹CC=critical care

*p<.05; **p<.01

Similar to logistic regression models, age had different effects in the specialty and inactive/non-licensure transition models. Age had significant and opposing linear effects in these two transition groups; however, these effect sizes were quite small (OR=0.99 and OR=1.01). Compared to those under the age of 29, CC RNs who were between the ages of 30 and 39 or 50 and 59 were less likely to remain in CC for longer times until a specialty transition. However, for those CC RNs who made a transition to inactive/non-licensure statuses, being 40 and 60 years of age increased the odds of remaining in CC for a longer period of time. For both of these types of transitions, CC RNs who were employed in rural areas had lower odds of remaining in CC for a longer time. Finally, RNs with an entry degree of ADN who made a transition to inactive/non-licensure status were more likely to remain in CC for a longer period of time until making a transition, compared to their BSN-obtained counterparts. Gender did not have an effect on the lengths of time CC RNs remained in CC before making either specialty or inactive/non-licensure transitions.

Specialty Transitions to Public/Community Health and Outpatient Areas

Of the 4,520 CC RNs who made a specialty transition, 236 CC RNs (5.2%) reported working in the public/community health specialty areas, 382 CC RNs (8.5%) reported working in outpatient settings, and 969 CC RNs (23.6%) reported working in community settings (refer to Table 4.6). Table 4.19 and Table 4.20 present the characteristics of those unique CC RNs who made a specialty transition to either public/community health or outpatient settings (n=1,379).

Table 4.19 Characteristics of Critical Care Registered Nurses Who Transitioned to a Public/Community Health or Outpatient Area (n=1,379)

Variable	n (%)	Variable	n (%)
Gender		Employment location at transition	
Male	119 (8.6)	Urban	1100 (79.8)
Female	1260 (91.4)	Rural	274 (19.9)
Missing	0 (0.0)	Missing	5 (0.4)
Race/Ethnicity		Employed full time	
White	1163 (84.3)	Full-time	1197 (86.8)
Black	152 (11.0)	Part-time	180 (13.1)
American Indian	13 (0.9)	Missing	2 (0.2)
Hispanic	17 (1.2)	RN licensure degree	
Asian	18 (1.3)	Diploma	121 (8.8)
Other	16 (1.2)	Associate	798 (57.9)
Missing	0 (0.0)	BSN	452 (32.8)
Age at transition, in years		MSN, other	1 (0.1)
<29	286 (20.7)	Missing	7 (0.5)
30-39	567 (41.1)	Year qualified for licensure	
40-49	343 (24.9)	Before 1970	9 (0.7)
50-59	157 (11.4)	1970-1979	65 (4.7)
60+	26 (1.9)	1980-1989	162 (11.8)
Missing	0 (0.0)	1990-1999	446 (32.3)
RN experience at transition, in years		2000-2009	693 (50.3)
Less than 5	280 (20.3)	2010 or later	3 (0.2)
6-9	432 (31.3)	Missing	1 (0.1)
10-19	447 (32.4)	Age at licensure, in years	
20+	219 (15.9)	21 and younger	126 (9.1)
Missing	1 (0.1)	22-25	542 (39.3)
Highest nursing degree at transition		26-29	250 (18.1)
Diploma	75 (5.4)	30-39	349 (25.3)
Associate	636 (46.1)	40-49	101 (7.3)
BSN	482 (35.0)	50+	10 (0.7)
MSN, doctorate	186 (13.5)	Missing	1 (0.1)
Missing	0 (0.0)		

Table 4.20 Characteristics of Critical Care Registered Nurses Who Transitioned to a Public/Community Health or Outpatient Area

Variable	n	Missing	Mean	SD	Min	Max	25 th percentile	Median	75 th percentile
Age at licensure, in years	1378	1	28.0	6.9	20.0	58.0	23.0	26.0	32.0
Age at transition, in years	1377	2	37.9	9.1	23.0	67.0	31.0	36.0	44.0
RN experience at transition, in years	1377	2	12.0	8.0	4.0	53.0	6.0	9.0	15.0
Time in CC at transition, in years	1379	0	3.5	2.2	1.0	12.0	2.0	2.0	4.0

CC RNs who transitioned to these specialty areas were primarily female, White, and between the ages of 30-39 in their transition year. In their first year after CC transition, these RNs primarily worked in urban areas and were employed full-time in public/community health or outpatient specialty areas. On average, CC RNs spent 3.5 years in CC before making a transition to public/community health or outpatient specialty areas. At the time of transition, the mean age of CC RNs working in these areas was 37.9 (SD=9.1). Approximately 13% of these RNs (n=133) were at least 50 years of age at the time of their transition. There was a higher percentage of RNs with MSN degrees or higher at the time of transition relative to their first years in CC (13.5% versus 2.8%; refer to Table 4.8 and see Table 4.19).

Bivariate regression models were used to analyze the effects of LCT variables on the likelihood of CC RN transition to public/community health or outpatient areas versus other specialty areas (see Table 4.21). Individual effects that were associated with higher likelihoods of transition to either a public/community health or outpatient area were: first observed at more

Table 4.21 Individual Effects of Critical Care Registered Nurses Characteristics on Transitions to either Public/Community Health or Outpatient Areas (n=4,509)¹

Variable	Odds Ratio	95% CI	p-value
First year in CC	1.04	1.02-1.07	<.001**
2001	--	--	--
2002	1.09	0.85-1.39	.513
2003	0.88	0.68-1.12	.290
2004	1.26	0.99-1.60	.060
2005	1.08	0.84-1.41	.540
2006	1.37	1.06-1.77	.015
2007	1.04	0.81-1.35	.755
2008	1.21	0.92-1.59	.179
2009	1.66	1.28-2.16	<.001**
2010	1.69	1.21-2.37	.002**
2011	1.27	0.89-1.81	.193
2012	2.60	0.16-41.77	.499
Missing	n/a	n/a	n/a
Age in CC, in years	1.00	1.00-1.01	.594
29 and younger	--	--	--
30-39	1.13	0.98-1.32	.098
40-49	1.02	0.86-1.22	.790
50-59	0.94	0.71-1.24	.640

60+	1.65	0.70-3.89	.251
Missing	0.80	0.08-7.66	.843
Age at transition, in years	1.00	0.99-1.01	.767
29 and younger	--	--	--
30-39	1.13	0.96-1.34	.154
40-49	0.97	0.80-1.17	.727
50-59	1.11	0.88-1.41	.366
60+	1.39	0.84-2.30	.199
Missing	n/a	n/a	n/a
Gender			
Female	--	--	--
Male	0.62	0.50-0.77	<.001**
Missing	n/a	n/a	n/a
Race			
White	--	--	--
Black	1.23	1.00-1.52	.050*
Asian	0.46	0.27-0.76	.003**
Other	1.36	0.94-1.97	.106
Missing	n/a	n/a	n/a
Year qualified for licensure	1.00	1.00-1.00	.200
1995 and earlier	--	--	--
1996-2001	0.96	0.82-1.13	.625
2002 and later	1.30	1.12-1.52	<.001**
Missing	0.35	0.04-2.87	.329
RN experience, in years, first observed in CC	0.99	0.98-1.00	.041*
4 or less	--	--	--
5-9	1.00	0.85-1.17	.964
10-14	0.88	0.72-1.08	.217
15-19	0.94	0.74-1.19	.585
20+	0.81	0.65-1.00	.049*
Missing	0.62	0.13-2.99	.550
RN experience, in years, in non-CC transition year	0.99	0.99-1.00	.073
4 or less	--	--	--
5-9	0.83	0.63-1.09	.169
10-14	0.75	0.56-0.99	.044*
15-19	0.83	0.61-1.13	.229
20+	0.71	0.53-0.96	.024*
Missing	0.83	0.61-1.13	.229
RN licensure degree			
BSN	--	--	--
Diploma	0.91	0.72-1.14	.005**
Associate	1.22	1.06-1.40	.403
MSN, other	2.50	0.16-40.12	.517
Missing	0.88	0.37-2.09	.766
Highest nursing degree, first observed in CC			
BSN	--	--	--
Diploma	1.00	0.77-1.31	.982
Associate	1.36	1.19-1.56	<.001**
MSN, or doctorate	0.95	0.64-1.41	.788
Missing	n/a	n/a	n/a
Highest nursing degree, in non-CC transition year			
BSN	--	--	--

Diploma	1.16	0.88-1.55	.304
Associate	1.61	1.40-1.85	<.001**
MSN, or doctorate	1.69	1.37-2.08	<.001**
Missing	n/a	n/a	n/a
Employment location, first observed in CC			
Urban	--	--	--
Rural	1.35	1.13-1.61	.001**
Missing	0.73	0.47-1.13	.162
Employment location, in non-CC transition year			
Urban	--	--	--
Rural	1.47	1.24-1.73	<.001**
Missing	0.46	0.18-1.21	.117

¹ Of the 4,520 critical care registered nurses who made specialty transitions, 11 had missing values for specialty area and setting, and were deleted from analysis

*p<.05; **p<.01

recent years in CC (1.04 times for each additional year after 2001); qualifying for RN licensure in 2002 or later as compared to 1995 or earlier (1.30 times); having an ADN as highest nursing degree in the first observed year in CC versus BSN (1.36 times); having an ADN as highest nursing degree in the non-CC transition year versus a BSN (1.61 times); having an MSN or doctorate as highest nursing degree in the non-CC transition year versus a BSN (1.69 times); being of Black versus White racial background (1.23 times); employment in a rural versus urban location in the first year observed in CC (1.35 times); and employment in a rural versus urban location in the year observed to have made a non-CC transition (1.47 times). Individual effects that were associated with a lower likelihood of transitioning to public/community health or outpatient areas were: being male versus female (0.62 times); having a nursing diploma versus a BSN at initial RN licensure (0.91 times); being of Asian versus White background (0.46 times); having 20 or more years of RN experience in the first year observed in CC versus less than 4 years (0.81 times); having 20 or more years of RN experience in the non-CC transition year versus less than 4 years (0.71 times); and having between 10 and 14 years of RN experience in the non-CC transition year versus less than 4 (0.75 times). CC RN age at their first observed CC

year or in their non-CC transition year were not significant predictors of making a transition to public/community health or an outpatient area.

Chapter Summary

Chapter Four presented the findings from this retrospective cohort analysis of RNs in NC from 2001-2013. Results were organized around the three study aims, and the eight hypotheses tested regarding the period, cohort, age, and gender effects on CC RN transitions out of the workforce. Results were presented for descriptive analyses and Poisson, logistic, and ordinal regression models. For Aims 2 and 3, the effects of LCT predictors on either the likelihood of transition out of the CC RN workforce or longer times in CC were examined. There was partial support for the effects of Recession versus non-Recession years (period effects) and graduation cohort (cohort effects) on transition outcomes. Highest nursing degree, race, rural versus urban employment, and years of RN experience also had significant effects on transition variables. Gender and age, however, did not have significant effects on transition outcomes.

Additional analyses that separated transitions to non-CC specialties (specialty transitions) and transitions to inactive/non-licensure statuses (attrition) showed that some LCT predictors, particularly age at first observation in CC and gender, had different effects on these types of transitions. Finally, and for exploratory purposes, additional analyses were conducted to identify the individual effects of LCT predictors on a certain type of specialty transitions, namely transition to public/community health or outpatient areas versus transition to other specialty areas. These findings and their implications will be discussed in more detail in Chapter Five.

CHAPTER 5. DISCUSSION

The purpose of this dissertation was to examine transitions made by CC RNs and to identify the factors that predicted this transition. Guided by LCT, this dissertation: 1) described the educational, demographic, geographic, and practice characteristics of the CC RN workforce in NC and the occurrence and types of CC RN transitions that occurred between 2001 and 2013; 2) examined the likelihood that RNs made transitions out of CC and identified the key LCT variables that affected the transition; and 3) determined how key LCT variables determined longer times that CC RNs stayed in CC before making a transition. The descriptive, Poisson regression, logistic regression, and ordinal regression analyses, together, inform differences in RN transition behaviors due to period, cohort, age, and gender effects. The results of this study provide opportunities for future directions in RN workforce research by expanding our limited knowledge of the effects of recessions on the RN workforce, and highlighting the importance of period, cohort, age, and gender effects.

This final dissertation chapter is organized into four major sections. This chapter presents: 1) a summary of major findings, by aim; 2) the overall meaning of findings, their importance, and additional questions; 3) limitations to the generalizability of study findings; and 4) current and future implications of this dissertation for research, theory, and practice.

Summary and Interpretation of Major Findings

Findings from this dissertation provide support for the effects of LCT predictors on CC RN transitions. However, the relationships between these LCT effects and CC RN transition outcomes were often not as hypothesized. Table 5.1 presents the findings of hypotheses tested

about period, cohort, age, and gender effects on RN transitions. Each of these will be discussed in further detail (by aim) in the next section.

Table 5.1 Summary of Dissertation Hypotheses and Findings

	Hypothesis	Analysis	Findings
H ₁	Smaller proportions of CC RN specialty transitions will occur during the Great Recession (2007-2009) than in other years of the study period.	Poisson regression	Not supported
H ₂	As the age of CC RN at first entry to CC increases, CC RNs become less likely to make a transition.	Logistic regression	Not supported ¹
H ₃	CC RNs who graduated from their entry-level nursing programs in more recent (i.e. later) years of the study period are more likely to transition out of CC than those who graduated in earlier years.	Logistic regression	Partially supported
H ₄	Male CC RNs are more likely to transition out of CC than female CC RNs.	Logistic regression	Not supported ¹
H ₅	CC RNs who began working during the Recession (2007-2008) are more likely to remain in CC for longer periods of time than those who began working in CC prior to the Recession.	Ordinal regression	Partially supported
H ₆	CC RNs who graduated from their entry-level nursing programs in more recent years of the study period are less likely to remain in CC for longer periods of time than those who graduated longer times ago.	Ordinal regression	Not supported ¹
H ₇	As the age of CC RN at first entry to CC increases, nurses are more likely to remain in CC for longer periods of time than those of younger ages.	Ordinal regression	Not supported ¹
H ₈	Male CC RNs are less likely to remain in CC for longer periods of time than female CC RNs.	Ordinal regression	Not supported ¹

¹Analyses of specialty transitions and inactive/non-licensure transitions in separate regression models provided additional findings about these hypotheses.

Aim 1: A Mobile CC RN Workforce

The first aim of this study was to describe the characteristics and occurrences of transitions in the NC CC RN workforce between 2001 and 2013. In NC, CC was the third most frequently reported specialty area in the active RN workforce, which increased in number annually, from 2001 to 2013. The number of RNs in CC also increased annually. Aside from an increase in the numbers of RNs with BSNs with a decrease in those with diploma degrees over time, the demographic and professional characteristics of the CC RN workforce (e.g., age,

gender, race, and employment locations) remained relatively unchanged in each year of the study period.

In any given year, about one-tenth of the CC RN workforce was observed to make a transition out of the CC workforce, either to a non-CC specialty area, to inactive status, or to non-licensure status. By following the work histories of the 12,969 unique RNs who identified working in CC for at least five years after they were first observed in CC, CC RNs were observed to be quite mobile within and out of the RN workforce, with more than half of the RN sample making a transition. In their non-CC years, CC RNs primarily continued working in inpatient settings and were most frequently working in other CC-related areas, such as emergency care, cardiology, and peri-operative specialty areas. A higher proportion of RNs with MSN or higher degrees were present in the sub-sample of CC RNs that had made specialty transitions, relative to the full CC RN sample and sub-sample of CC RNs that became inactive/non-licensed. Surprisingly, the overall rate of specialty transition out of the workforce was not different in Recession¹³ years (2007-2009) compared to non-Recession years.

Aim 2: LCT and the Likelihood of Transition

The second aim of this study was to examine the effects of LCT variables on the likelihood that RNs made transitions out of CC. Comparison of the characteristics of CC RNs who transitioned, versus those who did not, shows that the odds of transitioning were lower if: CC RNs' first years in CC were during the Recession relative to non-Recession years; if they had an ADN relative to a BSN as their highest nursing degree; and if CC RNs were Asian relative to White. CC RNs who were 60 or older in age versus younger than 29, with master's degrees or

¹³Recession, capitalized, refers specifically to the Great Recession that occurred in the U.S. and in national economies globally between 2007 and 2009.

higher versus those with BSNs, and CC RNs with more than 4 years of RN experience versus 3 or less years were more likely to have made transitions. Contrary to our hypothesis, CC RNs who were licensed in more recent years of the study period were less likely to transition out of CC; however, after controlling for other variables, this relationship changed directionality and was as hypothesized.

Taking specialty transitions and inactive/non-licensure transitions together, age and gender did not have an effect on transitions out of CC; however, when these two different types of transition were modeled separately, age and gender had significant, sometimes opposing, effects. Specifically, CC RNs who were between the ages of 30 and 49, compared to those 29 or younger, had lower odds of making a transition to inactive/non-licensure status while those who were 50 or older when first observed in CC, compared to those who were 29 or younger, had higher odds of making a transition to inactive/non-licensure status; age, however, was not significant for making a specialty transition. Male CC RNs had lower odds of making a specialty transition versus remaining in CC, but higher odds of making a transition to inactive/non-licensure was observed. Finally, CC RNs who qualified for licensure after 2003 were less likely to make both specialty transitions and transitions to inactive/non-licensure status. Although CC RNs with an MSN or higher degree (versus BSNs) were more likely to make a specialty transitions, highest degree did not have an effect on CC RNs' likelihood to leave the nursing workforce.

Aim 3: LCT and the Lengths of Time CC RNs Remain in CC

The final aim of this study was to examine the effects of LCT variables on the lengths of time that CC RNs remained in CC before making a transition. The CC RNs who were first observed to be in CC during the Recession years (2007 or 2008) were more likely to remain in

CC for longer periods of time, compared to those working in CC in years before the Recession. Contrary to the hypothesis, however, CC RNs who qualified for licensure in more recent years (2003 or later, relative to those licensed before 1992) were *more* likely (1.20 times) to remain in CC for longer times; however, this relationship was not significant after controlling for other LCT and control variables. Additional characteristics that decreased the likelihood of remaining in CC for longer periods of time were: employment in rural versus urban areas; possessing a BSN degree versus an ADN; having more than 4 years of experience compared to 3 or fewer years; and being 60 of age or older relative to 29 or younger. These relationships remained significant after controlling for other effects in composite models.

Similar to logistic regression models, when specialty and inactive/non-licensure transitions were modeled separately, age had a significant, and sometimes opposing, effect. Specifically, CC RNs who made transitions to inactive/non-licensure status and were between the ages of 40 and 59 were more likely to remain in CC for longer periods of time until they made the transition. For the CC RNs who made specialty transitions, those who were between the ages of 30 and 39, versus 29 or younger, were less likely to remain in CC for longer periods of time until transition. Gender was non-significant in these two separate models of longer times to transition.

Overall Meaning of Findings

Considered altogether, this dissertation demonstrates how a LCT perspective can offer guidance and opportunities for future nurse workforce research, and how period, cohort, age, and gender effects may influence the two different types of transitions that RNs can make throughout their careers: specialty transitions and transitions to inactive/non-licensure status. Prior nurse workforce research has largely ignored this interplay of social and historical forces on nurses'

behaviors. Literature on LCT, specialty transitions, and RN transitions out of the workforce were used to inform eight hypotheses about the effects of LCT on the likelihood of CC RN transitions and longer times that they remained in CC. The results of hypothesis testing, the overall meanings and importance of study findings, and the alignment of this dissertation's findings with previous investigations are described in the next sections.

Period Effects and CC RN Transitions

Studies rooted in LCT suggest that individuals' lives are linked with historical change. However, there is a gap in the nurse workforce literature about how these "period effects," particularly those experienced during an economic recession, may influence RN transitions out of the workforce and between specialty areas. In this study, period effects were represented by examining the rate of CC RN transitions during Recession years, and by determining whether the first year CC RNs were observed in CC occurred during Recession versus non-Recession years had an effect on their transition out of CC.

In a graph of the rates of transition occurrences from 2002 to 2013 (refer to Figure 4.3), there appeared to be an almost linear decrease in the rate that CC RNs were observed to make a transition to inactive status between 2006 and 2009. The rates of specialty transitions fluctuated visually during these years. However, in Poisson regressions of the mean rates of transition occurrences, there was no difference in the rate of CC RN transitions out of the CC workforce, by specialty transition or inactive transition separately or in combination, during Recession years (2007-2009) as compared to non-Recession years. It is important to note that the short time period for this dissertation analysis (n=13 years) and the two-year renewal for NC licensure might have affected these findings, as transitions were only observable as RNs renewed their licenses; the dataset lacked specificity about the actual year in which a transition occurred.

Additionally, this analysis examined the *first* transition that RNs were observed to make; however, it is possible that, for example, CC RNs could have made a transition prior to the Recession (and thus, been categorized as having made a transition in that year) and also made a transition in more recent years as well. This dissertation analysis did not account for these additional transitions. Future research of these NC RN licensure data, and other longitudinal data sources, could be improved by following and identifying those RNs who make not only their first but subsequent transitions in future years.

From regression modeling, there was some support for the effects of Recession versus non-Recession years on CC RN transitions and the length of time CC RNs remained in CC. Being first observed in CC during Recession versus non-Recession years had a significant effect on the likelihood of transition, and this relationship remained significant after controlling for other predictors. However, there was also a significant linear and decreasing effect on making a transition if CC RNs were observed for the first time in CC during more recent years of the study period. It is possible that, because Recession years occurred in more recent years of the study period, CC RNs were less likely to transition simply because they were observed in the study period for less time; however, the sampling strategy used in this dissertation attempted to mitigate these effects by allowing all RNs to have at least five years of data in which a transition could be observed. Additionally, RNs who were first observed to be in CC in Recession versus non-Recession years had higher odds of remaining in CC for longer time periods, further suggesting that there may be effects of Recession versus non-Recession years, versus being first observed in CC during more recent years. However, when data on RNs who made either a specialty or attrition transition during Recession versus non-Recession years were analyzed separately, being observed in CC during Recession years versus non-Recession years

significantly decreased the odds of remaining in CC for a longer time. Taken together with the logistic regression findings, this finding suggests that Recession versus non-Recession affected not only the likelihood of RNs making a transition but also the *timing* of their transition.

Collectively, the findings of this dissertation support the premise that RNs who are actively engaged in the workforce during economic recession years may only stay temporarily, that they may remain in the workforce for shorter lengths of time than their non-recession year counterparts, and that they may inevitably leave the workforce soon after a recession ends. In a study of newly licensed RNs, Brewer et al. (2012) found that RNs who started working during Recession years (2007-2008) had higher levels of organizational commitment and expressed greater intent to remain in their jobs than those in an earlier cohort. However, and despite their intent to stay, the Recession-year cohort in Brewer et al.'s (2012) study also indicated that they were more likely to be searching for a new job. Assuming that RN transitions occur intentionally and with some forward planning, findings from this dissertation align and offer additional rationale for the findings in Brewer et al.'s study (2012). In other words, RNs who are employed during a period of economic recession may be more likely to transition out of their jobs and less likely to remain in them, regardless of their dissatisfaction, and simply delay making these transitions because of their reluctance to leave a stable job until the recession ends. These findings raise additional questions about the effects of recession on RN transition behaviors. For example, if RNs are waiting until a recession ends to make a transition, how soon after the end of a recession do RNs typically make transitions? Also, and perhaps most importantly, how do economic recessions affect the workforce, and the capacity of the health care system to deliver care, over the short- and long-terms?

Findings by Buerhaus et al. (2009) and North et al. (2014) have raised concerns about and caution against the complacency that policymakers often feel when nurse shortages end temporarily during times of economic recession. Buerhaus et al. (2009) found that the Recession brought an increase in hospital RN employment, particularly by RNs over the age of 50 returning to work in these areas. However, their study did not examine the effect of the Recession on those RNs who were already in the workforce, or how the Recession affected RN transitions *out* of the workforce. Only one study was identified that examined RNs transitions out of the workforce during the context of an economic recession. North, Leung, & Lee (2014) found that annual separations for RNs who were 50 years and older declined sharply during the Recession and that reentries into the workforce increased. Although the data used in this dissertation spanned a longer timespan than that in North et al.'s (2014) study (13 years as opposed to five), Recession years occurred in the latter years of the study period and, therefore, a thorough assessment of the impact of the recessions on RN transitions was not possible. Future longitudinal analyses could elucidate these findings and identify the effects of these historical events on RNs of different ages, or between certain specialties, and their transition behaviors.

Cohort Effects and CC RN Transitions

In this analysis, graduation cohorts – or more specifically, the year in which CC RNs graduated from a nursing degree program and qualified for RN licensure – were used to index CC RNs and allow for comparisons between earlier and more recent graduation groups. New opportunities for RNs and the possibility of increased mobility for RNs informed a hypothesis that, controlling for differences in age, CC RNs who qualified for licensure in more recent years of the study period were more likely to transition out of CC than those who qualified for licensure a longer time ago, and less likely to remain in CC for longer periods of time.

These hypotheses were only partially supported. Year qualified for RN licensure had a significant effect in both logistic and ordinal regression models. In bivariate logistic regression models, being licensed as an RN in more recent years decreased the likelihood of a transition occurring. However, after controlling for LCT and other professional characteristics, licensure in more recent years actually *increased* the likelihood of transition out of CC (therefore, supporting our hypothesis). Specifically, the CC RNs who were licensed in 1999 or later, compared to those licensed before 1992, were more likely to transition in composite models. Ordinal regression models tested hypotheses about the effect of RN licensure years on the likelihood of remaining in CC for a longer time. In these bivariate models, the relationship between licensure qualification year and lengths of time in CC was not significant. However, additional analyses found that CC RNs who made *specialty* transitions and were licensed in 2003 or later, compared to those licensed before 1992, were less likely to remain in CC for longer periods of time until making a transition. For CC RNs who made transitions to *inactive/non-licensure status*, however, this relationship was not significant.

Findings from logistic regression models revealed that the directionality of the effect of RN licensure year changed when additional predictors were added. This finding suggests that there may be a possible interaction of RN licensure year with one of the other terms in the multivariate model. For example, at different ages or for males versus females, the effect of licensure year might have had different effects on the odds of transition. It is important to note that RNs who were licensed in earlier years were typically older in age than those who were licensed in more recent years. Although this study controlled for the effects of CC RN ages when first observed in CC, this study was limited in identifying more comprehensive cohort effects because of the study's relatively short 13-year timespan and the comparatively small samples of

RNs of the same ages in different licensure cohorts. For example, differences between the likelihood of transitioning for 25-year old CC RNs who qualified for licensure before 1990 and those who qualified for licensure in 2000 could not be compared using these 13-year data (refer to Table 4.11). To test study hypotheses, approximate quartile and tertile splits of RN licensure year were used in regression models; however, to more fully test hypotheses, larger samples of CC RNs of the same ages and in different cohorts would be needed so that CC RNs could be followed for a longer period of time to better identify cohort differences.

Age Effects and CC RN Transitions

Studies about people's work and careers, in general, have suggested that, people become more stable in their work positions and less likely to make transitions as they age and until they transition to retirement (Giannantonio & Hurley-Hanson, 2011; Super, 1957). In nursing, studies have provided some evidence to support the premise that RNs tend to be more satisfied and less likely to turnover as age increases (Hayes et al., 2006; Hayes et al., 2012; Zurmehly et al., 2009). However, these findings are not consistent (Brewer, Kovner, Greene, & Cheng, 2009) and may only apply to organizational turnover and not transitions out of the nursing workforce per se. Findings from this dissertation study indicated that the effect of age, measured as a continuous variable, was not significant. However, in categorizing CC RNs' ages in 10-year groups and separating out the different types of transitions, we found some support for the claim that RNs, in general, tend to stabilize within their nursing careers as they age and as compared to younger RNs. We found that CC RNs who were between 30 and 49 years old when they first were observed to be in CC, relative to those 29 or younger, were less likely to make a transition to inactive/non-licensure status. Age, however, had no effects on the likelihood of making a specialty transition. This finding suggests that, at least for their first observed transition in the

data and after controlling for other effects, CC RNs who were between the ages of 30 and 49 tended to be more likely to remain in the RN workforce rather than exiting from it.

Older RNs and their Transitions

Consistent with the findings of Alameddine et al. (2010) and Nooney et al. (2010), we found that CC RNs who were 60 years of age or more during their first observed year in CC were more likely to transition and less likely to remain in CC for longer time periods. This is congruent with previous research on retirement, as RNs become eligible for Social Security benefits and separate from the workforce in anticipation of their retirement. However, and perhaps most interesting, this study found that when separate models for specialty transitions and inactive/non-licensure status were analyzed, the effects of age, particularly for CC RNs who were between 50 and 59 and relative to CC RNs aged 29 or younger, were different. Relative to CC RNs who were 29 or younger, age did not have significant effects on the likelihood of specialty transitions. However, both as an individual effect and when controlling for other effects, CC RNs between 50 and 59 years of age were more likely to become inactive/non-licensed than those aged 29 or younger, and these older RNs had higher odds of remaining in CC for longer times before making these transitions.

Although the specific age categorizations have differed in other studies of older RNs, Alameddine et al (2009), Holmas (2002), and Nooney et al. (2010) had similar findings. In their study of RNs in the U.S. who were inactive or working in non-nursing fields, Nooney et al. (2010) found that there was a slight increase in the rate of RNs who reported working in non-nursing fields in their 50s. In a study of Norwegian RNs, Holmas (2002) found that the probability of exiting a hospital job, which generally decreased with age, actually increased and continued to increase when RNs reached the age of about 41. Finally, in their descriptive

analyses, Alameddine et al. (2009) found that RNs in the 54- to 65-year-old age group, and no other age groups, were far more likely to drop out of the nursing workforce than to change settings. Findings from these studies, and from this dissertation, support the belief that RNs over the age of 50 may be less likely to remain in CC and other hospital areas, and more likely to leave nursing altogether.

This study only looked at the *first* transitions that RNs were observed to make in the data and did not account for additional or multiple transitions that might have occurred afterward. In a study of RNs over the age of 50 by North et al. (2014), almost a quarter of the transitions made by RNs of this age were temporary, and of those RNs who returned to the nursing workforce, almost two-thirds returned to the same employment setting. However, in its use of administrative data, the analysis by North et al.'s (2014) analysis could not differentiate between a permanent separation from nursing altogether (e.g., because of retirement) versus separating from the RN workforce for other reasons (e.g., because of illness, working overseas, or extended leave). This dissertation's findings, like those of North et al. (2014), raise many additional questions about older RNs' behaviors, especially as they plan and transition towards retirement. For example, do older nurses leave because they are retiring earlier than usual, or because they are leaving to work in non-nursing areas? When and how do they return to the nursing workforce? And, perhaps most important, what would motivate older RNs to return to the workforce? Future research could elucidate this dissertation's findings and identify patterns of separation and reentry for RNs of different ages, and over longer timespans.

Gender Effects and CC RN Transitions

Contemporary studies of work, particularly those guided by a LCT perspective, have demonstrated that gender has a persistent, if not cumulative, effect on transitions at different

stages of individuals' working lives. In nursing, several studies have found that being male was associated with shorter tenures in the nursing profession (Barron & West, 2005), increased hazards of labor force separation (Nooney et al., 2010), and a greater likelihood of leaving clinical practice (Adoor et al., 2014; Black et al., 2010). However, in this dissertation, these findings were not supported; gender did not have a significant effect on either the likelihood of a transition out of CC to a different specialty, or the likelihood of remaining in CC for longer times.

Contrary to expectations, when transition outcomes were separated into specialty transitions and inactive/non-licensure transitions, gender had significant and opposing effects. Compared to female CC RNs, males were less likely to make a specialty transition and more likely to transition out of the nurse workforce altogether, than to either remain in CC or make a specialty transition. In other words, this dissertation found that male CC RNs, relative to females, were less likely to pursue work in other specialty areas and, rather, more likely to leave nursing altogether.

To our knowledge, no studies have examined the effects of gender on RN *specialty* transitions; however, several studies have found differences between males and females when they transition out of nursing. In their study of United Kingdom nurses who left the nursing profession, Barron and West (2005) found that being male was associated with shorter tenure in the profession, especially in those RNs who went to work in other occupations. Similarly, Black et al. (2010) found that males were twice as likely to maintain active nursing licenses and choose non-nursing work than females. Black et al. (2010) further suggested that opportunities outside of nursing may be more available for male RNs than females. However, the work motivations of male nurses, compared to females, might also be a contributing factor. For example, in studies of

accelerated degree program nursing students, Hoffart et al. (2019) found that male nursing students, relative to female students, were more likely to place a higher value on certain features of nursing as a job – such as job availability, economic security, and flexible career paths – than the desire to help others. Following this logic, males may also be more motivated than females to make transitions to roles outside of nursing that embody more of these job characteristics than nursing. Discerning differences in nursing opportunities and trajectories between males and females remains a fairly underdeveloped area of study. However, these dissertation findings indicate the need for further research about how male and female RNs may differ in both their perceptions of nursing work and the availability of opportunities to them within and outside of the nursing profession.

Other Effects on CC RN Transitions

Finally, this dissertation research identified several other predictors of CC RN transitions. First, those RNs with ADN versus BSN degrees as their highest nursing degrees were less likely to transition and more likely to remain in CC for longer periods of time. Additionally, RNs with an MSN or doctorate as their highest nursing degrees were more likely to transition out of CC, but these degrees had no significant effect on the lengths of time CC RNs remained in CC. Human capital theory suggests that, as people make personal investments in themselves via educational advancement, experience, and other professional opportunities, they may be more likely to change jobs to advance their careers (Bartel, Beaulieu, Phibbs, & Stone, 2014; Becker, 1994; Jones & Gates, 2007). Findings from this dissertation support this notion but are limited in identifying the specific roles and jobs to which RNs make a transition, which raises additional questions. For example, do CC RNs and non-CC RNs with an MSN or doctorate as their highest degree similarly make specialty transitions that result in higher, more advanced positions? Do

RNs with master's or doctoral degrees outside of nursing (e.g., master's in business administration, master's in public health, or masters or doctorate degrees in other areas) make similar specialty transitions as those who advance their education in nursing? Future research could clarify how obtaining higher levels of education might affect the types of transitions that RNs make, particularly those who were previously employed in CC and other hospital specialty areas.

Second, years of experience was a significant predictor of CC RN transitions, and those with more experience were more likely to transition out of CC. In this study, years of experience was calculated by subtracting RN licensure year from the first year an RN was observed to be in CC. This calculation was a proxy for years of nursing experience, and it was based on an RNs' years of *potential* RN experience. However, this calculation did not account for the number of years an RN was actually practicing in either NC or in another state, nor did it account for any time an RN might have stepped out of the workforce to return to school or for family reasons. Nevertheless, this finding supports that of other studies in suggesting that RNs who work in hospitals, because of its particularly labor-intensive nature, are more likely to leave the hospital setting to take jobs outside of hospitals or in non-nursing areas. These other studies have reported that RNs, particularly those who are older and with more years of experience, pursue work outside of hospitals because it has fewer physical demands (Chappell, Verswijveren, Aisbett, Considine, & Ridgers, 2017; Uthaman, Chua, & Ang, 2015), improves their quality of life (Ashley et al., 2017; Hartung, 2005), or provides alternatives to typical nursing shift work schedules (Clendon & Walker, 2013; Frager & Depczynski, 2011; Gabrielle, Jackson, & Mannix, 2008). Future analyses could seek to clarify the effects of years of experience on RN

workforce transitions, particularly those who make transitions from hospital to non-hospital areas, or who leave the workforce.

Finally, rural versus urban employment locations had significant effects on the likelihoods of specialty transitions and transitions to inactive/non-licensure status, but in opposing directions. CC RNs who were employed in rural areas were more likely to make specialty transitions and less likely to transition to inactive/non-licensure status than CC RNs in urban areas. Additionally, employment in rural versus urban areas affected the length of time CC RNs remained in CC, with those employed in rural areas being less likely to remain in CC for longer times than their urban CC RN counterparts. Taken together, the transitions of RNs employed in rural and urban areas may be explained based on work environment differences or because of macro-level changes to rural hospitals that might affect CC RNs working in them. For example, rural hospitals have reportedly had more inadequate nurse staffing (Baernholdt & Mark, 2009; Cline et al., 2014), worse nurse-physician relations (Baernholdt et al., 2017), and lower job satisfaction (Baernholdt et al., 2017) than urban hospitals. Our findings suggested that although CC RNs in rural areas were less likely to remain in CC, they were still more likely to stay in and actively practice in the RN workforce. Therefore, CC RNs who are employed in rural areas may be more inclined to leave and pursue work in other specialty areas, particularly maybe those areas outside of hospitals.

Additionally, rural hospitals, on average, have had fewer ICU beds and lower occupancy rates than hospitals in urban areas (North Carolina Rural Health Research Program, 2020), and rural hospitals may be more likely to have merged with other hospitals or even closed during this study period (Noles, Reiter, Pink, & Holmes, 2014; Sinay, 2008). Recent discussions about ICU beds in the U.S. have called for the regionalization of ICU care, or the transfer of critically ill

patients from low to high-volume hospitals, to consolidate CC in high-volume areas and potentially save more lives (Brown, 2015; Seymour et al., 2015; Kahn, Branas, Schwab, & Asch, 2008a; Kahn et al., 2008b). These shifts and changes in the delivery of ICU care, particularly in the reduction of ICU beds and CC capacity in rural areas, could affect the opportunities available for RNs to remain in CC. To date, few studies have examined the impact of rural location, especially in the context of health care delivery changes, on RNs' work and work transitions. However, it is reasonable to consider that as ICU care continues to shift more towards urban locations, the CC RNs who previously staffed CC areas may be affected and seek nursing work in other specialties and settings.

Limitations to Generalizability

This dissertation built on research in LCT to analyze RN career transitions in the context of changing times and changing lives. This study made use of a uniquely rich data source for the NC RN population to provide insights into RN transition behaviors. However, this research has several limitations.

First and foremost, this study used secondary data, which imposes certain limitations. The most obvious limitation of secondary analyses is in its omitted variable bias. Omitted variables are concerning because the absence of a critical variable could result in the misspecification of regression models and can affect estimates of the true effects of LCT and control variables on transition outcomes. This is particularly important in this study as this study could not include important LCT variables that likely influence RN transitions. In particular, family and job characteristics, such as marital status, children and family characteristics, job satisfaction, salary, or wage were not available. Without data on these variables, it is not possible to fully identify the effects of these important variables on transition outcomes.

Second, censoring is a concern with these analytic strategies. Censoring occurs when 1) a transition occurred and was not observed within the study window or 2) transitions occurred prior to the study period and affect the actually observed transitions. This problem was addressed in two ways: first, by reducing the sample so that each CC RN could be followed for at least 5 years; and second, by testing whether the effects of a prior work history were significant. Future studies that span longer periods of time, or that include advanced sequence methodologies, could be used to address this study's limitations.

Third, the analyses used in this study were generally descriptive in nature. Therefore, the underlying processes that generate differences in RN transitions remain unidentified. Although this dissertation research identified several characteristics of RNs that influence their likelihoods of transition and times remaining in CC, further research is needed to help understand the causal mechanisms and processes that bring about differences in transition outcomes. Newer and more sophisticated techniques that are being used in LCT, such as Cox proportional hazards modeling and optimal matching sequence analysis methods, could advance the methodological approaches to studies of RN transitions and uncover additional information about the pathways to which transitions unfold.

Fourth, data on RNs used in this study were obtained directly from RNs via the completion of a voluntary, online licensure renewal survey that occurred every 2 years. Therefore, time-varying variables – such as the age and year in which RNs were first in CC and when a transition occurred – could not be pinpointed. Our findings might have been affected by these data reporting inaccuracies. We addressed this concern by employing a number of sampling strategies to account for these data concerns, and we used a more proximal age time point to predict RN transitions than used in previous studies of RN transitions. Specifically, this

study used the age when RNs were first observed in CC as a starting point for assessing a transition, versus their age at licensure.

Fifth, this sample was limited to those RNs who remained licensed as RNs in the state of NC throughout the study period. The RNs who left NC to practice in another state were included in this study as having made a transition out of CC, but these nurses might have actually remained in active practice or in CC elsewhere. Any generalizations beyond the state, or about active practice in CC or as an RN, should be made with caution. However, reports of national and other states' RN workforce characteristics (NCSBN, 2016) suggest that the RN workforce in NC may be similar, and behave similarly, to RNs in other states.

Finally, it is possible that RNs transitioning out of other specialty areas, especially those in non-hospital settings, behave differently than those RNs who transition out of CC. Therefore, speculations about RN specialty transitions from other areas should not be made based on this study's findings of descriptive, secondary, biennially-collected data from one state.

Implications for Research, Theory, and Practice

Research

Prior nurse workforce research has largely focused on the transition into certain specialty areas, rather than the transition *out* of them, relied on qualitative or cross-sectional survey designs, and been atheoretical. The findings from prior research has been important, as it contributed to the development of this study, and to the growth and advancement of knowledge about RN transitions. However, prior research has not fully accounted for the different types of transitions that RNs can make and the time-changing social structures that might affect different cohorts of nurses during and throughout their careers.

Studies using LCT offer a perspective that prior nursing research has lacked, illustrating how to think about phenomena in the context of larger social and historical factors, identify the effects of the timing of events (e.g., in the ages in which people experience the events), and understand how the accumulation of changes map out and influence individuals' future trajectories and outcomes. This dissertation acknowledges the interplay of social and historical events – such as economic recessions or the shared experiences in different cohorts of RNs – and how these events might combine to affect transitions and produce different career decisions for RNs throughout their lives. Findings from this dissertation indicate that constructs from LCT can be used to help explain the contributions of contextual factors on the likelihoods of CC RNs making transitions. These findings underscore the necessity of examining various social changes, such as the effects of economic recessions and the age-related factors that contribute to work behaviors, on nurses' behaviors, and point to the use of LCT as an important area in future nurse workforce research. There is a need for study designs that consider additional period effects related to the organization of healthcare and nurse education, such as new innovations in technology and telehealth or investments in different types of degrees (e.g., the Doctor of Nursing Practice [DNP]) on nurses' work behaviors and work transitions. By embedding RNs' work in the context of these changing healthcare and social structures, researchers may contribute to a better understanding of how these macro-level initiatives affect individual RN transitions and careers.

Recommendations for Future Research on Nurse Trajectories

Transitions are key concepts in LCT, but an important consideration is that transitions are actually embedded in trajectories. According to life course researchers, trajectories occur over lengthy periods of time and are marked by specific events and changes (e.g., entering and leaving

a job) (Elder & Giele, 2009). Trajectories typically evoke from sequences of transitions, providing additional meaning and shape to these transition experiences.

This dissertation research did not examine *when* multiple transitions occurred or *how* multiple transitions coincided to evoke transition sequences (i.e., trajectories) and influence outcomes throughout RNs' work lives. Furthermore, the idea that transitions can generate life-long advantages or disruptions is a fruitful area for future research to help understand RN transitions. In particular, a number of additional research questions could be generated based on this idea. For example, at what age, or at what point in their careers, do RNs perceive a specialty transition to be most advantageous and the least disruptive for their lives? How do the timing and number of transitions affect RNs' careers, their lifetime incomes, and their lives, overall?

This analysis was limited to observing CC RNs for a 13-year period (i.e., at least 5 years and up to 8 years, spanning the 13-year period), and focused only on RNs' *first* observed transition, not accounting for re-entry or the multiple transitions that could occur. This is an important consideration for future research, given the relative mobility of RNs and the ease in which RNs can make transitions. Future research of these NC RN licensure data, and other longitudinal data sources, could be improved by following and identifying those RNs who make not only their first but subsequent transitions in future years. Studies of other longitudinal data sources, such as the NSSRN and other state licensure data, could span longer time periods, pinpoint more proximal timepoints of age to the transition occurrence (e.g., the actual ages in which RNs make transitions), and employ newer and more sophisticated statistical methods – such as event history or Cox proportional hazards modeling (similar to those methods recommended by Bub & Feretti, 2013 or used by Black et al., 2010; Fraher, 2009; Holmas, 2007;

Nooney et al., 2010) – to help identify the actual ages in which RNs make transitions out of the specialty and the effect of LCT variables on the timing of their transitions.

Additionally, to account for the multiple transitions that RNs may make, contemporary LCT research has benefitted from the development of advanced statistical techniques, such as sequence analysis, that could additionally be considered in the area of work transitions research (Abbott, 1995; Brzinsky-Fay, 2014). These advanced techniques could better map out the temporal ordering of transitions throughout RN career trajectories, describe how these work transitions unfold across individuals' lifespans, and identify how these patterns affect later-in-life outcomes.

Theory Development

This dissertation found support for the theoretical constructs of LCT in the phenomenon of RN transitions. However, compared to the current literature on the applications of LCT to studies of work, few of the hypotheses about the effects of period, age, cohort, and gender on transition outcomes were supported. This suggests that nurses may behave differently from other professions and these other studies of work. Most notably, nursing is a predominantly female profession and offers a different perspective than traditional studies of work that have tended to focus on males. Therefore, studies of nursing have much to offer to the development of LCT, with implications about the roles and impacts that women have on the labor force, economies, and societies.

Years of Experience and Work Transition Phenomena

Additional analyses of the CC RN licensure data used in this study suggests that years of experience (rather than age) may be a better predictor of RN transitions. It is important to note that, in bivariate models, years of RN experience had a significant effect on transition outcomes.

In prior studies, years of experience is often the variable used in modeling instead of age for this very reason. However, years of experience was not included in modeling of transition outcomes in this study because an alternate categorization of first year in CC was used (e.g., non-Recession versus Recession years) along with the year nurses qualified for RN licensure. In other words, nurses' experience was operationalized by subtracting the year the RN qualified for licensure from the first year in CC, and these two variables were already included in composite regression models.

Prior nurse workforce studies have shown that nurses' age and years of experience are often highly correlated – that is, as RN age increases, so too does their years of nursing work experiences. These effects are often differentiated in their individual effects on outcomes but not accounted for, simultaneously (i.e., as composite effects), in regression models (Black et al., 2010; Holmas, 2002). Theoretically, RN transition behaviors may be motivated by the amount of time they've spent in a labor-intensive profession (or their career stage) rather than their biological age itself, or some interaction of the two. Few studies of nurse transitions have included both age and years of experience in their conclusions. Future studies should consider a comparison of these two variables on transition outcomes and how they may depend on one another (i.e., have a moderation effect) to produce different effects on transitions at different career points throughout RNs' lives. Doing so will help us better understand the theories that guide our research, and help researchers select the particular variable might be more advantageous to use in certain studies or to examine certain workforce behaviors.

The “Linked Lives” Perspectives of LCT

This analysis, unfortunately, could not examine the effect of “linked lives” on transition outcomes. Studies examining linked lives generally include variables such as marital status, the

presence of children, or household and other family-related factors that might influence RN transition and professional behaviors. Although these variables were unavailable in the dataset used in this study, future research studies should seek out data to address key questions that helps us better understand the phenomenon of “linked lives” in nurses’ workforce behaviors. For example, a focus in this area could help address questions such as: how do concerns about work-life balance affect RN transition behaviors out of CC? What factors influence the planning of CC RN careers and career transitions? What attracts CC RNs to other non-CC specialty areas? The life course perspective frames a number of important questions about an individuals’ relationships with others, and how these relationships influence their personal and professional domains.

Practice

Finally, these findings have several important implications for policymakers and organizational leaders. With concerns about nursing shortages and the capacity of the nurse workforce to meet rapidly changing healthcare delivery needs, it is imperative to consider how highly prepared and skilled segments of the RN workforce, especially those with specialized training that extends beyond entry-level nursing education, can contribute and improve population health outcomes and support new care delivery models. Predicting when transitions occur and the factors that influence them is only part of the challenge – understanding why RNs transition and how to incentivize them to stay, make a transition to a needed area of health care, or return to the workforce are the ultimate policy-relevant goals.

Nursing Retention

Hospitals and organizations are faced with the challenge of recruiting and retaining experienced RNs. Some hospital leaders have expressed concern that newly licensed RNs seek

hospital employment for a few years to gain clinical experience, only to leave and pursue graduate education or professional advancement to become a nurse practitioner, certified registered nurse anesthetist, and other advanced practice roles. Similarly, older RNs (particularly those over the age of 50) with many years of clinical experience may transition to part-time schedules, reduce their hours, or leave the nursing workforce altogether. Older and more experienced RNs who advance their knowledge and skills are advantageous to keep in the nursing workforce to reduce errors and improve patient quality (Blegen et al., 2001), improve work environment and organizational outcomes (Kanai-Pak et al., 2008), and retain efficiency and wisdom in nursing (Bleich et al., 2009; Hatcher et al., 2006). In CC areas, specifically, experienced nurses develop a contextual practical knowledge that enables them to help patients have dignified deaths, organize care practices, avoid errors, and contribute to the learning of new staff (Acebedo-Urdiales et al., 2014). Employers and policymakers who take steps to retain these nurses are able to maintain the knowledge and human capital of their RN workforce, thereby capitalizing on the benefits of their investments, and improving the organization's, state's, and national nurse workforce capacity to deliver high-quality patient care.

Employers that can make work environment and structure modifications and support RNs as they age, or as they transition across nursing educational levels, can retain RNs as they build out their careers. Organization retention strategies such as allowing for flexible work hours (Clendon & Walker, 2013; Hatcher et al., 2006; Letvak, 2002); providing higher salaries and financial incentives to delay retirement (Norman et al., 2005); redesigning work environments to have, for example, better ergonomics, decentralized storage of supplies, and better lighting at the bedside (Hatcher et al., 2006; Spiva, Hart, and McVay, 2010); and providing additional supports with technology updates and workflow changes (Hatcher et al., 2006) are recommended to retain

these nurses. Additionally, creating an organizational culture of retention – such as those in Magnet® hospitals (Kelly et al., 2012; Laschinger et al., 2003; Scott et al., 1999) and AACN-awarded Beacon¹⁴ units (Ulrich et al., 2007) – and improving staffing and scheduling, including better pay and improved benefits, and improving manager-nurse relationships have been discussed as strategies to improve employee satisfaction and retention for RNs overall (Buffington et al., 2012; Force, 2005).

Nursing Education

Nursing is becoming increasingly more educated and diverse. Stimulated by the IOM's "Future of Nursing" report (IOM, 2011), the nursing profession has made changes to its education and practice structures to increase its percentages of BSN and doctoral-prepared nurses, and to support new models of care. Second-degree nursing programs, including accelerated second-degree to BSN nursing programs and clinical nurse leader programs, are educating RNs with a broad range of non-nursing experiences and knowledge to more readily enter the profession (Raines & Taglaireni, 2008; American Association of Colleges of Nursing, 2008b). Data in this dissertation did not allow the differentiation of RNs who were traditional students versus those with second-degrees; however, our findings showed that RNs who were between the ages of 30 and 39, a likely age for attaining a second-degree in nursing, were less likely to leave the RN workforce compared to those 29 or younger. Additionally, RNs in this same age group had lower odds of remaining in CC for longer times until making a specialty transition. However, focused research in this area is needed to better understand the relationships in this segment of the nursing workforce.

¹⁴This refers to the Beacon Award for Critical Care Excellence awarded by the American Association of Critical Care Nurses.

Two studies that examined the motivations of second-degree students found that older students, relative to their younger counterparts, were better able to outline deliberate decisions about entering nursing, and derive the motivations intrinsically as they pursue nursing as a career (e.g., seeking satisfying work to contribute to the well-being of society versus factors such as flexible hours, autonomy, and employment security) (Bye et al., 2007; Miers et al., 2007; Raines, 2011). These second-degree nurses are a growing and valued population of the nursing workforce, and their potential might not be fully appreciated. Policymakers and organizational leaders should expand and support education opportunities for second-degree students, develop and test strategies that encourage the retention of these RNs, and provide research funding for research that further examines the motives and career paths of these students. By acknowledging the unique differences between second-degree students who change careers, versus traditional ones, policymakers and nursing leaders can continue to build the nurse workforce's value, diversity, and capacity.

Dissertation Conclusions

Because of their additional training and certifications, CC RNs bring unique skills, knowledge, and value to the RN and healthcare workforce to meet changing care demands in our country and support the population's overall health. Various recent events -- natural disasters, pandemics, and emergency situations (e.g., the COVID-19 pandemic) -- have highlighted the value of quickly mobilizing RNs with relevant prior or ongoing CC experience to support the training of RNs with other experiences to take care of critically ill hospitalized patients. Unfortunately, current workforce research and planning typically operate under the assumptions that all nurses behave in the same ways, regardless of their specialty areas and work histories, and that nurses behave independent of the social and historical contexts in which they are

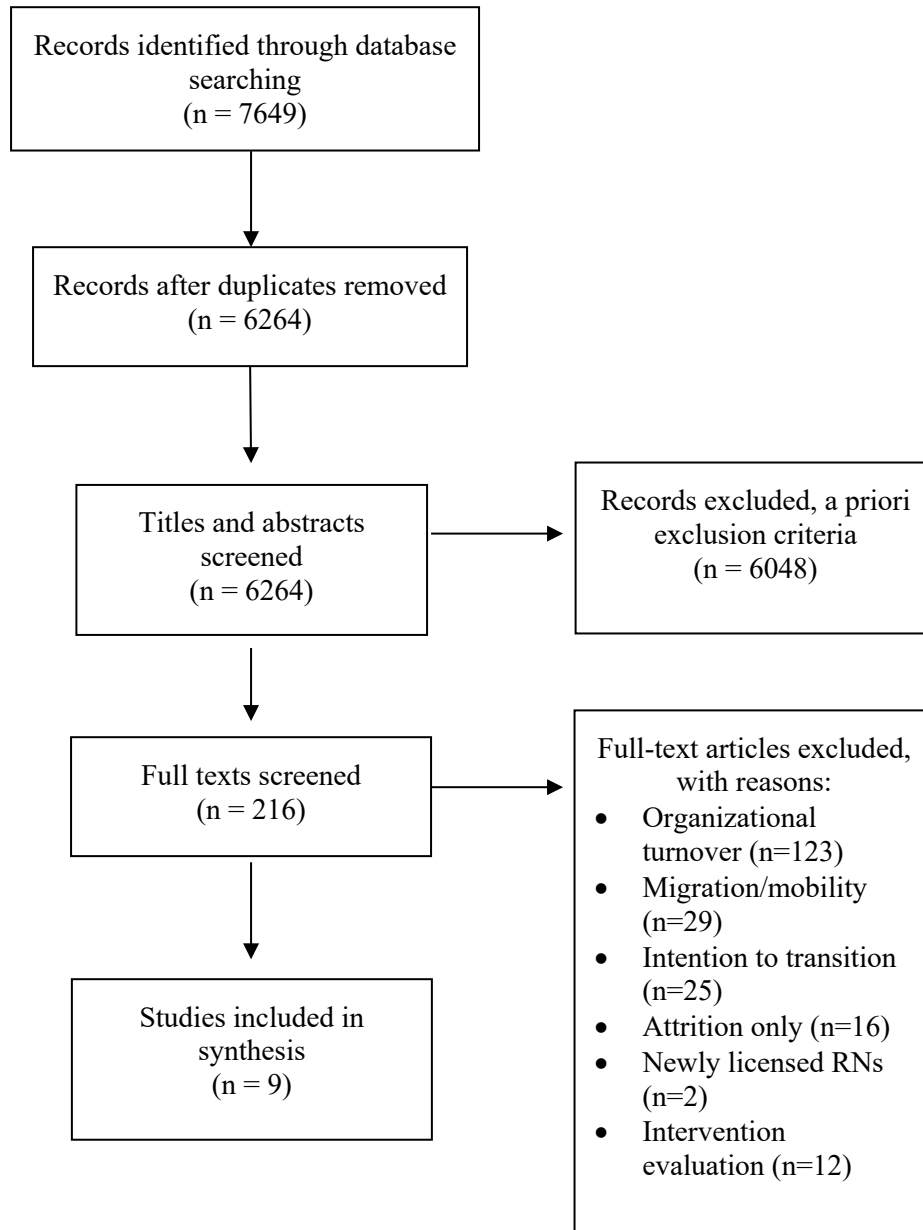
situated. By overlooking the importance of specialty area and work history differences and contextual factors, policymakers and organizational leaders are ill-equipped to implement strategies and take steps to address the specific needs of health populations that arise. Knowledge of RN transition behaviors, in temporal contexts, can inform policymakers' and hospital leaders' 1) understanding of the effects of similar historical events, and 2) development of relevant and targeted interventions to address workforce needs amidst these changing times.

In its applications of a life course perspective, this dissertation underscores the importance of examining RN work behaviors within broader environmental contexts. Employers and policymakers who implement targeted strategies – such as allowing for flexible work hours, redesigning work environments, and providing additional supports during technology updates – are better able to retain nurses, particularly those RNs who are older and more experienced, and build their nurse workforce capacity. Additionally, policymakers and nursing leaders who invest in education structures that can incentivize and support second-degree students to pursue careers in nursing will continue to enhance the value and diversity of the nursing workforce. Future research that accounts for the multiple transitions that nurses can make would offer further insights into the patterns, flexibility, and movements of nurses throughout their careers and lifespans, and can help inform future workforce planning efforts.

Findings from this dissertation provide information about the factors influencing the transition of CC RNs, and potentially those of other specialty area RNs, out of the specialty workforce and the greater RN workforce. This knowledge can help leaders, policymakers, and researchers to develop reasoned and sound workforce planning initiatives, and to prioritize future directions in nurse workforce research. Research on nurse transitions can help design evidence-based policies and employer-based strategies that can enhance workforce capacity and aid in

workforce planning efforts during times of change and need in the immediate and long-term future.

APPENDIX A
PRISMA Diagram for RN Specialty Transitions Review



APPENDIX B

Selected Studies of LCT and Work Transitions

Author, year	Purpose	Country Sample	Methods	Findings
Birkett, Carmichael, & Duberley, 2017	To enhance understanding of how career histories affect broader retirement experiences	England Men and women in their 50s-70s (n=50)	Semi-structured interviews and occupational history calendar data	• Six clusters, or career trajectories, were identified among participants with similarities in career path and broadly similar distribution of resources over time. • Strong relationship between career trajectory, resource accumulation, and experiences of retirement • Financial resources, health, and social networks had a more significant impact on retirement outcomes. • Retirement is complex and diverse in its nature.
Fraher, 2009 (*dissertation)	To explore whether the choice of rural practice location diverged for male and female physicians of the same age in different birth cohorts.	United States Physician licensure data (n=33,338)	Retrospective, longitudinal analysis	• Females in earlier birth cohorts were significantly less likely than male colleagues to choose rural practice settings; this gender effect was much smaller in Gen X cohort • Both male and female MDs in the Gen X cohort were less likely than an earlier cohort to practice in rural counties • MDs over the age of 50 were more likely to choose rural settings than younger MDs
Han & Moen, 1999	To examine the temporal patterning of retirement.	United States Randomly selected older workers and retirees (n=458)	Structured interviews and survey questions	• Historical context (measured by cohort) is significant in explaining differences in the age respondents begin planning, target retirement age, actual retirement age, and likelihood of taking an early retirement incentive (ERI). • Gender significant in explaining when respondents began to plan for retirement; men begin to plan significantly earlier than women. • Biographical pacing (embodied in work history) shows the strongest effect on actual timing of retirement. Those following an orderly career retired the earliest. Career pathway type also affects the expectation of retirement timing but not its planning.
Huang & Sverke, 2007	To identify and describe occupational career patterns (OCPs) from age 16-43	Sweden Swedish women (n=549)	Optimal matching techniques to sequence data	• Women's OCPs were related to family of origin but more strongly to their overall life career (i.e. multiple role constellations over the life course). • OCPs do matter in terms of job perceptions, work attitudes, and quality of life

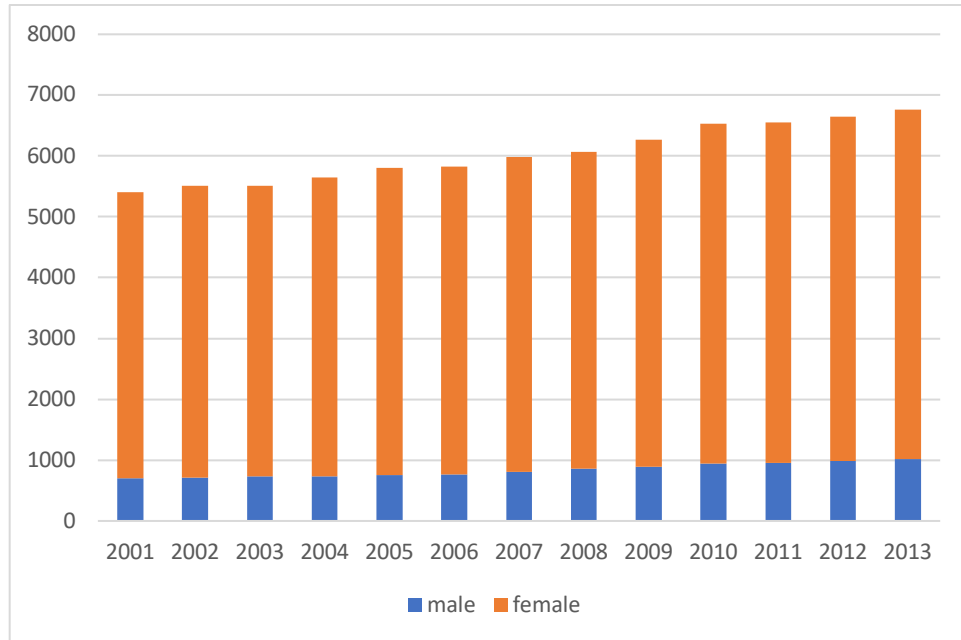
Jones, 2017 (*unpublished report)	To examine the likelihood of RN educational advancement after attaining the initial nursing degree; the time interval for RNs to advance their education; how RN educational advancement affected RN employment	United States RNs (n=170,684)	Retrospective, longitudinal analysis	• RNs most likely to advance their education after attaining initial nursing degree were ADN prepared; worked in a hospital setting, obtained their initial licensure in 1986-1995 or 1996-2005 at the age of 18-21 • RNs most likely to transition to obtain a masters or doctoral degree were White, female, in Gen X (1965-1979) age cohort, licensed between 1986-1995, licensed at younger age (18-21), initially licensed in the US, never licensed as an LPN
Jepsen & Choudhur, 2001	To identify and describe occupational career patterns (OCPs) over 25 years for single grade cohort of rural high school graduates	United States Rural high school graduates (n=170)	Survey design	• Career patterns captured individual differences in early to mid-adult careers. A variety of specific patterns emerged but they could be grouped into three general patterns that accounted for 65.9% of participants. • More than 1/3 of respondents experienced stable OCPs, remaining in the same occupation type throughout the 25 years. • Gender, but not family of origin SES, was a powerful variable in explaining OCP stability but not to midlife career satisfactions. • Women are more likely than men to experience changing OCPs. • People seemed to make transitions during the period around age 25.
Kojola & Moen, 2015	To explore how working and retired white-collar Boomers are working and the meanings and motivations for their decisions and plans in their later careers.	United States Working and retired white-collar men and women born 1946-1964 (n=27)	Qualitative interviews	• There is no single dominant pattern for retirement, but rather a diverse mix of pathways shaped by occupational identities, finances, health, and perceptions of retirement. • Boomers express a desire to have control over their time and to find meaning and purpose in either paid or unpaid activities. • Life course transitions, normative cultural scripts, gender and class locations, and workplace and social policies constrain their decisions and plans.
Livingston, 2017 (*dissertation)	To explore how third age female pediatricians consider and experience career transitions and the influence of career transitions on their development	United States Female pediatricians ages 61-72 (n=8)	Qualitative interviews	• Career transitions were based on commitment to spouse and family and a desire to continue meaningful work found in their calling as caregivers. • Control of schedule and self-determination about work were key factors in study participants' career transitions. • Continuity of identity and role loss influenced transitions to mitigate transition effects.

Lorz & Muhleck, 2019	To determine gender differences in men and women choosing for or against continuing an academic career	Germany German graduates of upper-secondary education with higher education entrance qualification (n=6,646)	Retrospective analysis of panel data	- Gender differences are mainly due to <i>transitions</i> between stages of education and to a less extent due to different success rates of female and male students within educations (i.e. <i>graduations</i>). - Gender differences are more pronounced in the early stages of the academic career and less relevant at later stages.
Schoon, Martin, & Ross, 2007	To examine antecedents and outcomes of educational and occupational aspirations of young men and women, covering transitions from dependent childhood into independent adulthood	Britain Data from the 1958 National Child Development Study and 1970 British Cohort Study (n=10,900)	Path analysis	- Findings demonstrate the persistent role of gender, social origin, individual agency processes, and influence of changing socio-historical context on career development - Significant cohort and gender differences regarding the influence of school motivation on exam performance, and its effect is highest for men born in 1958 and women born in 1970. - The entry into motherhood before age 29 appears more important than entry into fatherhood in predicting occupational status at 30/33.
Sweet & Moen, 2007	To compare middle-class dual-earner couples in which wives were currently returned to school with couples in which wives had never returned to school	United States Wives in school (n=124; n=24); wives never returned to school (n=866)	Mixed methods: survey data and interviews	- Compared to those who never returned to school, wives who returned to school were less than 40 years of age and not parents. - Returns to school generally resulted in little, if any, reapportionment of the gender divisions of labor between husbands and wives; predicted lower evaluations of marital satisfaction for women and their husbands with school-age children.

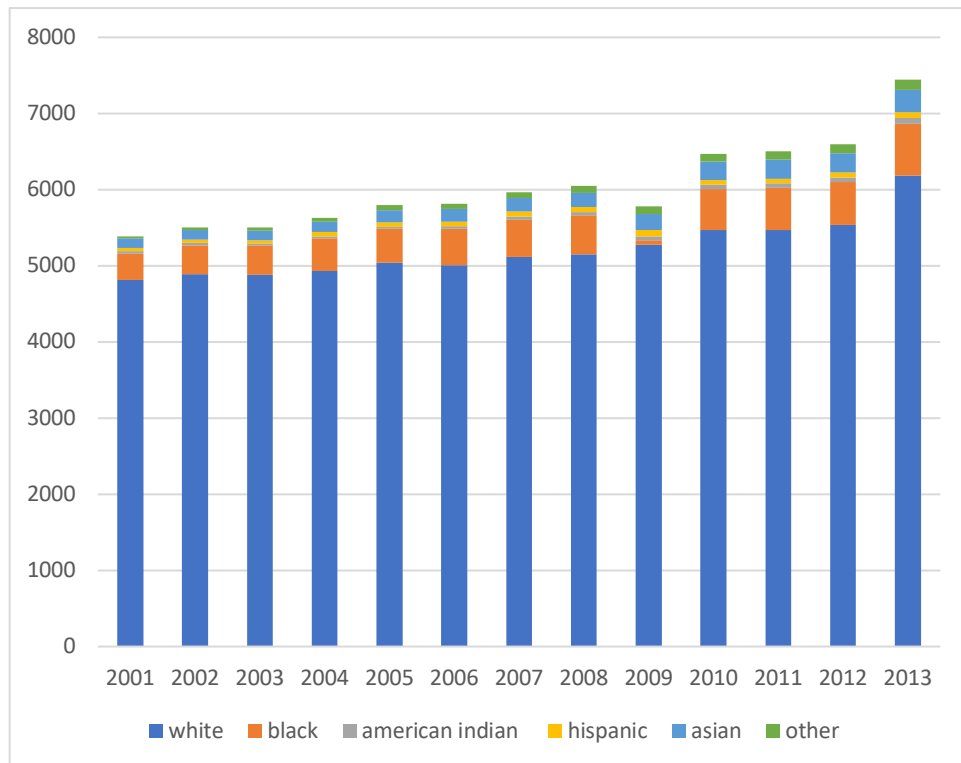
APPENDIX C

North Carolina Critical Care Registered Nurse (NC CC RN) Workforce Composition, 2001-2013

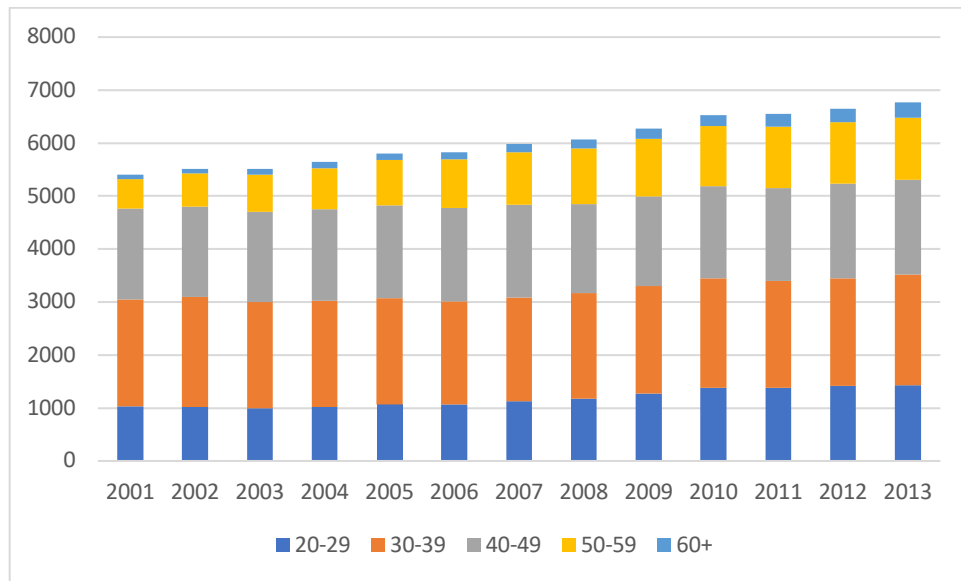
Appendix C.1. Number of Males and Females in the NC CC RN Workforce



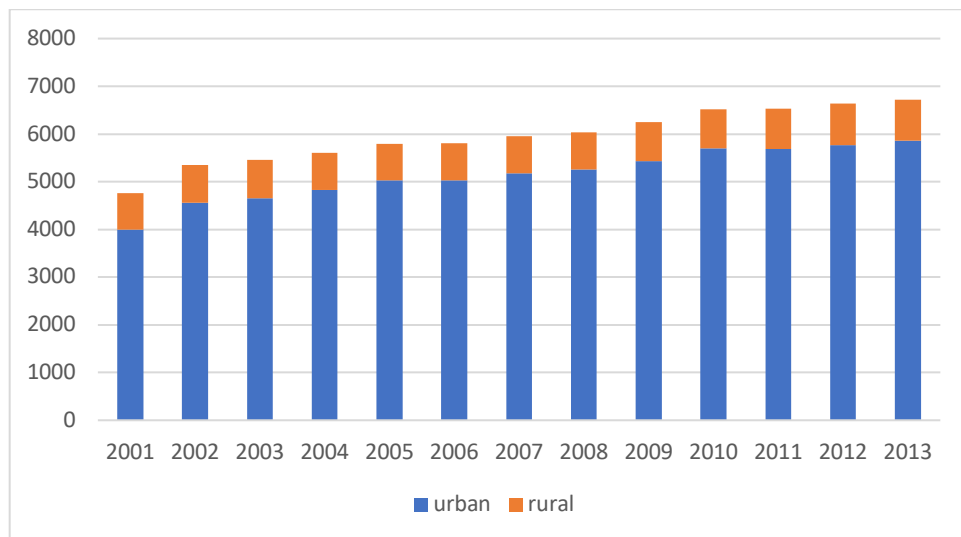
Appendix C.2. Race Groups in the NC CC RN Workforce



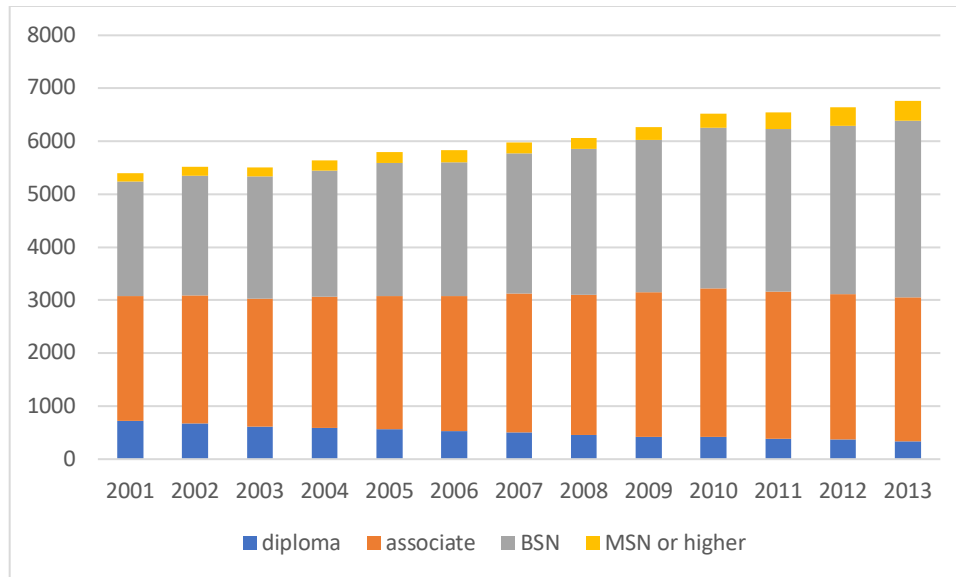
Appendix C.3. Ages in the NC CC RN Workforce



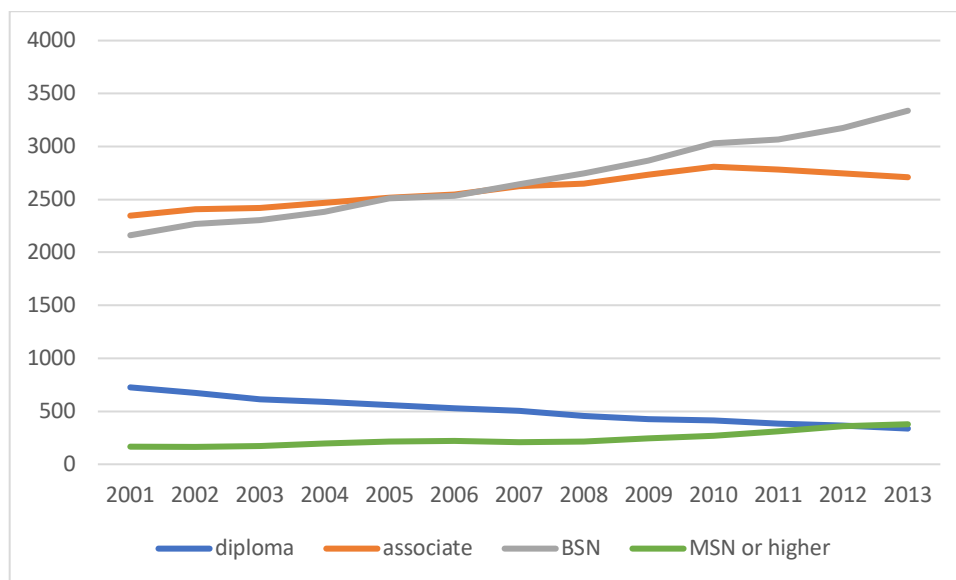
Appendix C.4. Rural and Urban Employment Locations in the NC CC RN Workforce



Appendix C.5. Highest Nursing Degrees in the NC CC RN Workforce



Appendix C.6. Trends in Highest Nursing Degrees in the NC CC RN Workforce



APPENDIX D

Bivariate Logistic Regression Models, Akaike Information Criteria (AIC) scores

First year in CC	Continuous*	8570.867
	Categorical, by year	8566.231
	Recession versus non-Recession	8756.069
Year qualified for licensure	Continuous*	9002.257
	Squared term only	9001.953
	Continuous, with squared term	9003.748
	10-year groups	8998.464
	Approximated quartile splits	8918.418
	Approximated tertile splits	8958.721
Age in CC	Continuous	9069.861
	Squared term only	9068.298
	Continuous, with squared term*	9064.505
	10-year groups	9065.824
	Approximated quartile splits	9070.030
	Approximated tertile splits	9067.766
Age at licensure	Continuous	9051.673
	Squared term only	9051.561
	Continuous, with squared term	9052.613
	10-year groups	9064.282
	Approximated quartile splits	9073.371
	Approximated tertile splits	9064.435
Gender	Dichotomous	9070.977
Years of RN experience	Continuous	9069.838
	Squared term only	9058.333
	Continuous, with squared term	9056.632
	5-year groups (until 10-19, 20+)	9054.329
	10-year groups	9048.223
	Approximated quartile splits	9050.988
	Approximated tertile splits	9047.560
Highest nursing degree	Diploma, ADN, BSN, masters, doc	9028.988
	Diploma, ADN, BSN, masters+	9028.259
Entry nursing degree	Diploma, ADN, BSN, masters+	9043.348
Race	6 group categorizations	9061.632
	4 group categorizations	9059.539
Rural versus urban	Dichotomous	9051.854

*p<.05 in bivariate models

APPENDIX E

Logistic Regression Model Selection¹ Akaike Information Criterion (AIC) Scores

First year observed in CC		RN ² licensure year				Age in CC				Degree		AIC score
Continu- ous	Categor- ical	Contin- uous	Quartil- es	Tertiles	10-year groups	Contin- uous	10-year groups	Quartil- es	Tertiles	Entry	Highest nursing	
X		X				X				X		8547.6
X		X				X					X	8523.0
X		X					X			X		8546.6
X		X					X				X	8522.0
X		X						X		X		8549.1
X		X						X			X	8524.3
X		X							X	X		8548.9
X		X							X		X	8524.3
	X	X				X				X		8542.6
	X	X				X					X	8518.9
	X	X					X			X		8541.9
	X	X					X				X	8518.3
	X	X						X		X		8544.2
	X	X						X			X	8519.3
	X	X							X	X		8543.9
	X	X							X		X	8519.3
X			X			X				X		8554.9
X			X			X					X	8523.2
X			X				X			X		8552.9
X			X				X				X	8521.1
X			X					X		X		8556.2
X			X					X			X	8525.4
X			X						X	X		8557.4
X			X						X		X	8526.4
	X		X			X				X		8550.9
	X		X				X			X		8549.3
	X		X			X					X	8519.3

First year observed in CC		RN ² licensure year				Age in CC				Degree		AIC score
Continuous	Categorical	Continuous	Quartiles	Tertiles	10-year groups	Continuous	10-year groups	Quartiles	Tertiles	Entry	Highest nursing	
	X		X				X				X	8517.6
	X		X					X		X		8552.1
	X		X					X			X	8521.4
	X		X						X	X		8553.3
	X		X						X		X	8522.3
X				X		X				X		8555.6
X				X		X					X	8525.0
X				X			X			X		8554.2
X				X			X				X	8523.5
X				X				X		X		8556.8
X				X				X			X	8527.0
X				X					X	X		8557.8
X				X					X		X	8527.8
	X			X		X				X		8551.5
	X			X		X					X	8521.2
	X			X			X			X		8550.4
	X			X			X				X	8520.1
	X			X				X		X		8552.5
	X			X				X			X	8523.0
	X			X					X	X		8553.6
	X			X					X		X	8523.8
X					X	X				X		8547.1
X					X	X					X	8523.9
X					X		X			X		8545.1
X					X		X				X	8521.2
X					X			X		X		8549.8
X					X			X			X	8527.3
X					X				X	X		8550.1
X					X				X		X	8527.7
	X				X	X				X		8543.4

First year observed in CC		RN ² licensure year				Age in CC				Degree		
Continuous	Categorical	Continuous	Quartiles	Tertiles	10-year groups	Continuous	10-year groups	Quartiles	Tertiles	Entry	Highest nursing	
	X				X	X					X	8520.6
	X				X		X			X		8541.8
	X				X		X				X	8528.4
	X				X			X		X		8545.9
	X				X			X			X	8523.7
	X				X				X	X		8546.2
	X				X				X		X	8524.1

¹ Gender, race, degree, and urban versus rural employment location were included in each of these models and part of the calculated AIC scores (see Chapter 3)

² RN=registered nurse

APPENDIX F

Logistic Regression Model, with Alternate Categorization for Year Qualified for Licensure

Variable	Odds Ratio	95% CI	p-value
First year in CC	0.77	0.75-0.79	<.001**
Year qualified for licensure			
Before 1992	--	--	--
1992-1998	1.19	1.00-1.41	.054
1999-2002	1.38	1.13-1.68	.001**
2003 or later	1.36	1.09-1.68	.006**
Age in CC, in years			
29 or younger	--	--	--
30-39	1.02	0.89-1.17	.815
40-49	1.07	0.89-1.28	.486
50-59	1.30	1.00-1.69	.047*
60 or older	3.26	1.24-8.54	.016*
Gender			
Female	--	--	--
Male	0.92	0.79-1.07	.286
Highest nursing degree, in CC			
BSN	--	--	--
Diploma	0.87	0.70-1.09	.227
Associate	0.67	0.60-0.75	<.001**
MSN, doctorate	1.55	1.02-2.35	.039*
Race			
White	--	--	--
Black	1.02	0.84-1.23	.838
Asian	0.62	0.47-0.82	.001**
Other	0.90	0.68-1.20	.471
Employment location			
Urban	--	--	--
Rural	1.15	0.97-1.35	.100
Missing	1.24	0.85-1.80	.273

*p<.05; **p<.01

APPENDIX G

Bivariate Ordinal Regression Models, Akaike Information Criteria (AIC) scores

First year in CC	Continuous*	17760.793
	Categorical, by year	17768.192
	Recession versus non-Recession	17780.107
Year qualified for licensure	Continuous*	17799.896
	Squared term only	17798.929
	Continuous, with squared term	17794.260
	10-year groups	17798.086
	Approximated quartile splits	17792.669
	Approximated tertile splits	17793.180
Age in CC	Continuous	17803.725
	Squared term only	17803.853
	Continuous, with squared term	17805.495
	10-year groups	17803.852
	Approximated quartile splits	17808.269
	Approximated tertile splits	17805.658
Age at licensure	Continuous	17739.253
	Squared term only	17739.152
	Continuous, with squared term	17740.098
	10-year groups	17798.989
	Approximated quartile splits	17807.355
	Approximated tertile splits	17799.500
Gender	Dichotomous	17803.930
Years of RN experience	Continuous	17803.172
	Squared term only	17758.505
	Continuous, with squared term	17757.957
	5-year groups	17792.677
	Approximated quartile splits	17792.352
	Approximated tertile splits	17790.372
Highest nursing degree	Diploma, ADN, BSN, masters, doc	17755.456
	Diploma, ADN, BSN, masters+	17755.038
Entry nursing degree	Diploma, ADN, BSN, masters+	17777.741
Race	6 group categorizations	17809.373
	4 group categorizations	17805.957
Rural versus urban	Dichotomous	17762.183

*p<.05 in bivariate models

APPENDIX H

Ordinal Regression Model Selection¹ Akaike Information Criterion (AIC) Scores

First year observed in CC		RN ² licensure year				Age in CC				Degree		AIC score
Continu- ous	Recessi- on years	Contin- uous	Quartil es	Tertiles	10-year groups	Contin- uous	10-year groups	Quartil es	Tertiles	RN licensure	Highest nursing	
X		X				X				X		17709.9
X		X				X					X	17681.1
X		X					X			X		17706.6
X		X					X				X	17678.3
X		X						X		X		17712.2
X		X						X			X	17683.5
X		X							X	X		17708.0
X		X							X		X	17679.5
	X	X				X				X		17720.2
	X	X				X					X	17692.8
	X	X					X			X		17717.8
	X	X					X				X	17689.9
	X	X						X		X		17723.2
	X	X						X			X	17694.8
	X	X							X	X		17719.3
	X	X							X		X	17691.2
X			X			X				X		17712.5
X			X			X					X	17683.1
X			X				X			X		17710.2
X			X				X				X	17681.1
X			X					X		X		17716.1
X			X					X			X	17686.7
X			X						X	X		17712.0
X			X						X		X	17682.9
	X		X			X				X		17722.0
	X		X			X					X	17695.8
	X		X				X			X		17719.1

First year observed in CC		RN ² licensure year				Age in CC				Degree		AIC score
Continu- ous	Recessi- on years	Contin- uous	Quartil es	Tertiles	10-year groups	Contin- uous	10-year groups	Quartil es	Tertiles	RN licensure	Highest nursing	
	X		X				X				X	17693.1
	X		X					X		X		17724.9
	X		X					X			X	17698.5
	X		X						X	X		17721.1
	X		X						X		X	17695.0
X				X		X				X		17712.9
X				X		X					X	17684.6
X				X			X			X		17710.5
X				X			X				X	17682.2
X				X				X		X		17716.3
X				X				X			X	17687.8
X				X					X	X		17711.7
X				X					X		X	17683.3
	X			X		X				X		17722.7
	X			X		X					X	17697.1
	X			X			X			X		17719.8
	X			X			X				X	17694.2
	X			X				X		X		17725.6
	X			X				X			X	17699.9
	X			X					X	X		17721.2
	X			X					X		X	17695.6
X					X	X				X		17712.1
X					X	X					X	17680.6
X					X		X			X		17711.2
X					X		X				X	17680.0
X					X			X		X		17716.1
X					X			X			X	17685.1
X					X				X	X		17712.3
X					X				X		X	17681.7
	X				X	X				X		17720.0

First year observed in CC		RN ² licensure year				Age in CC				Degree		AIC score
Continu- ous	Recessi- on years	Contin- uous	Quartil es	Tertiles	10-year groups	Contin- uous	10-year groups	Quartil es	Tertiles	RN licensure	Highest nursing	
	X				X	X					X	17688.4
	X				X		X			X		17722.9
	X				X		X				X	17694.6
	X				X			X		X		17721.4
	X				X			X			X	17693.3
	X				X				X	X		17726.1
	X				X				X		X	17697.9

¹Gender, race, degree, and urban versus rural employment location were included in each of these models and part of the calculated AIC scores (see Chapter 3)

²RN=registered nurse

APPENDIX I

Ordinal Regression Model, with Alternate Categorization for First Year in CC and Year Qualified for Licensure

Variable	Odds Ratio	95% CI	p-value
First year in CC			
Non-Recession years	--	--	--
During Recession	1.22	1.09-1.36	<.001**
RN licensure year			
Before 1992	--	--	--
1992-1998	0.97	0.87-1.08	.506
1999-2002	1.05	0.91-1.22	.477
2003 and later	1.03	0.88-1.21	.704
Age in CC, in years			
29 or younger	--	--	--
30-39	0.97	0.87-1.07	.551
40-49	1.07	0.93-1.22	.366
50-59	1.04	0.86-1.26	.737
60 or older	0.52	0.30-0.91	.021*
Gender			
Female	--	--	--
Male	1.00	0.89-1.12	.997
Highest nursing degree, in CC			
BSN	--	--	--
Diploma	1.06	0.91-1.25	.432
Associate	1.39	1.27-1.52	<.001**
MSN, doctorate	0.85	0.65-1.12	.235
Race			
White	--	--	--
Black	0.92	0.80-1.06	.247
Asian	1.27	1.01-1.59	.042*
Other	1.06	0.84-1.32	.643
Employment location			
Urban	--	--	--
Rural	0.76	0.68-0.86	<.001**
Missing	0.50	0.40-0.64	<.001**

*p<.05; **p<.01

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