2020

Alabama'S Acute Care Registered Nurse Workforce: A Study In Supply And Demand

Tracey Dick
University of Alabama at Birmingham

ALABAMA'S ACUTE CARE REGISTERED NURSE WORKFORCE: A STUDY IN SUPPLY AND DEMAND

by

Tracey K. Dick

PATRICIA A. PATRICIAN, COMMITTEE CO-CHAIR
LORI A. LOAN, COMMITTEE CO-CHAIR
DAVID BECKER
KATHLEEN LADNER
PENG LI

A DISSERTATION

Submitted to the graduate faculty of The University of Alabama at Birmingham,
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy

BIRMINGHAM, ALABAMA

2020

ALABAMA'S ACUTE CARE REGISTERED NURSE WORKFORCE: A STUDY IN SUPPLY AND DEMAND

TRACEY K. DICK

NURSING

ABSTRACT

Background/Significance: Nurses comprise the largest sector of the total health care workforce. Acute care hospitals have historically been major employers of registered nurses (RNs). What is currently known about Alabama's acute care RN workforce supply is limited. Additionally, a paucity of data is available to describe employer demand. Alabama's aging population, chronic disease burden, and health care system reforms suggest that the demand for RNs will continue to grow. Data are needed to provide a greater understanding of current and future RN supply and demand to inform workforce planning, educational investment, and state health policy.

Purpose: To characterize the current and future supply and demand of Alabama's acute care registered nurse workforce.

Methods: A cross-sectional exploratory, descriptive design was employed. Acute care registered nurse supply was evaluated utilizing 2016 and 2018 de-identified secondary data collected by the Alabama Board of Nursing's voluntary survey administered during RN license renewal. Sample descriptive data, including age, gender, race, ethnicity, education, experience, workforce participation, and plans to leave the workforce, were explored. Acute care registered nurse demand was investigated utilizing the *Survey of Acute Care Registered Nurse Employers in Alabama 2019.* Labor market perceptions and facility-level practices related to RN educational preparation were explored.

Findings: *Supply:* Estimated full-time equivalents (FTEs) contributed by acute care nurses in Alabama decreased between 2016 (25,549.50 FTEs) and 2018 (23,707.50 FTEs). Data trending from the last decade reflect a declining number of RN licenses issued by the Alabama Board of Nursing due to examination (i.e., new graduate nurses). *Demand:* Seventeen (68%) of CNOs reported overall acute care RN need as high demand with difficulty filling open positions. Twenty (80%) CNOs reported high demand for experienced RNs.

Discussion: This study provided evidence of a current acute care nursing shortage in Alabama. Ongoing data collection contributing to what is known about Alabama's supply and demand of the acute care RN workforce should be a legislative and health care sector priority.

Keywords: registered nurse, workforce, supply, demand

DEDICATION

To my God who holds the future.

To my husband, David, who has sacrificed many hours of our life together to support my love for learning.

To my daughter Lindsay, for telling me time and time again how proud she is of her mama.

To my daughter Aimee, who models for me daily how commitment and hard work lead to success.

To my parents, who have taught me about unconditional love for 54 years.

To nurses everywhere. I am honored to be a part of such an extraordinary group of health care professionals. You are an exemplar of God's love in action.

ACKNOWLEDGMENTS

This dissertation is the result of my committee's selfless devotion to my success.

Dr. Patricia Patrician: My sincere gratitude for your friendship and extraordinary mentorship. You are the reason that I chose UAB's School of Nursing for my doctoral studies. Thank you for not only encouraging me, but also challenging me as I was forced to grow through this journey.

Dr. Lori Loan: Thank you for your friendship, grace, and high standards. Your attention to detail is analogous to the expectations that I hold for my own students. I have learned, through your example, that providing positive feedback while allowing students to try again and again eventually leads to success.

Dr. Kathleen Ladner: Words cannot adequately express how thankful I am to have met you and worked with you over the past few years. Your service on my committee opened many doors to me which allowed this research to happen. Thank you for all you have done to support this research.

Dr. David Becker: When I chose to take a health economics course as part of my program of study, I honestly did not realize how much it would impact my current and future research. I am so very grateful that you agreed to contribute your expertise to this research.

Dr. Peng Li: Your arrival as a faculty member in the school of nursing could not have happened at a better time. Thank you for making sure that I always had a meeting time reserved on your calendar. Your expert coaching in data analysis has expanded my appreciation of statistical and practical significance in research.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ABN	Alabama Board of Nursing
ACS	American Community Survey
ADN	associate degree in nursing
AHA	Alabama Hospital Association
AL-HAC	Alabama Health Action Coalition
APRN	advanced practice registered nurse
BSN	bachelor of science in nursing
CNM	certified nurse-midwife
CNO	chief nursing officer
CNP	certified nurse practitioner
CNS	clinical nurse specialist
CPS	Current Population Survey
CRNA	certified registered nurse practitioner
DON	director of nursing
FTE	full-time equivalent
HRSA	Health Resources and Services Administration
NACNEP	National Advisory Council on Nursing Education and Practice
NCLEX-RN	National Council Licensure Exam-RN
NLN	National League for Nursing

NPS	Nursing Personnel Survey
NSSRN	National Sample Survey of Registered Nurses

CHAPTER 1

INTRODUCTION

The purpose of this chapter is to delineate the need for and importance of registered nurse (RN) workforce supply and demand research. This chapter will provide an overview of the research problem supported by a discussion of the background and significance of the problem. Study purpose, aims, and research questions are explained, and a brief introduction to the conceptual framework, study design, methods, and terminology are presented.

Registered nurses, who comprise the largest sector of the total health care workforce, have long been considered vital to ensuring health care access and quality (Buerhaus et al., 2000a). In 2011, the Institute of Medicine (IOM) (renamed the National Academy of Medicine in 2015) released a pivotal report, *The Future of Nursing: Leading Change, Advancing Health*, that served as a catalyst and a blueprint to guide the transformation of the nursing workforce to lead quality and value efforts in health care (IOM, 2011). One of the four key recommendations of the report addressed a need for better data collection to support workforce planning and health care policy. Around the same time, the Patient Protection and Affordable Care Act (2010) established a National Health Care Workforce Commission that was to play an advisory role to the U.S. Congress and the Administrative Branch for health care workforce issues. The objectives of that commission were to include working with state entities to understand current and projected health care workforce supply and demand (American College of Physicians,

2013). Unfortunately, the commission never received congressional funding, and thus its charge and potential impact on state-level data collection and analysis describing health care labor markets have never been fully realized.

Problem Statement

Acute care hospitals have historically been major employers of RNs. Forty-five percent of RNs in Alabama reported work in a hospital setting in 2014 (Alabama Health Action Coalition, 2014). In 2016, survey data collected by the Alabama Board of Nursing reflected an increase in those numbers. Fifty-one percent of RNs who completed their voluntary survey reported primary employment in hospitals (Alabama Board of Nursing, 2017). However, only 49 percent of the 69,922 Alabama RNs who renewed licensure in 2016 participated in the voluntary survey. Therefore, the survey results may not adequately represent the state's RN population.

Employer demand for acute care nurses in Alabama is also poorly understood. Alabama lacks a robust mechanism to evaluate employer demand. Several autonomous agencies contribute their own abbreviated data. For example, the Alabama Hospital Association conducts a member survey and collects limited data on nursing vacancy rates (L. Gibson, personal communication, December 12, 2017). The U.S. Bureau of Labor Statistics annually publishes occupational employment statistics for the occupational category of registered nurses (U.S. Bureau of Labor Statistics, n.d.). These are two examples of data sources that each provide limited information on this topic. However, there is no evidence of ongoing and comprehensive state-level data collection for acute care RN demand, which could be used to identify and address workforce shortages, surpluses, or states of equilibrium.

A lack of RN state-level workforce data places Alabama in a precarious position during times of health care delivery reform, changing population demographics, and population health crises such as pandemics. Policymakers must have reliable information about the state of workforce supply and demand. Nursing care in hospitals is delivered 24 hours a day, 7 days a week. No other health profession provides as many hours of direct patient care. Workforce planning, educational investments, and health policy require greater attention to ongoing data collection and the establishment of an information infrastructure. Data are needed to inform employers, policymakers, and stakeholders about the numbers and types of nursing professionals needed to meet health care demand both now and in the future (IOM, 2011). Therefore, this study characterizes the current supply of and demand for acute care RNs in Alabama. In addition, study data combined with publicly available data are used to provide short-term estimates of future supply and demand for acute care hospital RNs in Alabama.

Background and Significance of Problem

National-Level Registered Nurse Workforce Data

The number of RNs licensed in the United States is currently estimated to be 4.5 million (Smiley et al., 2018) with an expected occupational growth rate of 15% over the next decade (U.S. Bureau of Labor Statistics, 2018). The need for an RN workforce supply large enough to meet health care industry demand has been of significant interest for many years. The 2011 IOM report documented a growing concern that the U.S. nursing supply may always fall short of nursing demand. Nursing organizations, such as the American Association of Colleges of Nursing (AACN, 2017a) and the National League for Nursing (NLN, n.d.), have conveyed concern about the impact and extent of a

nursing shortage. The demand for nursing services is impacted by multiple factors, including (a) an aging population, (b) chronic disease burden of the population, and (c) health care system reforms.

An Aging Population

The number of U.S. residents age 65 and over has grown by 34.2% over the last decade (U.S. Census Bureau, 2020). By 2030, one of every five Americans will be retirement age (Vespa et al., 2018). Residents age 65 and older are projected to constitute 23.1% of the population by 2060 (U.S. Census Bureau, 2018).

Along with the general population, nurses are also aging. In the United States, an extended period of economic recession during the late 1980s and 1990s resulted in RNs returning to the labor force and/or delaying an early exit from the workforce. The result was a higher proportion of older nurses in the workforce (Buerhaus & Auerbach, 2011). This pattern, combined with fewer numbers of young people choosing nursing as a career during that time, created a nursing workforce demographic shift (Nooney & Lacey, 2007). The RN median age is currently 53 years old (Smiley et al., 2018), and according to the Health Resources and Services Administration (HRSA), the average hours worked by RNs typically drop significantly after age 60 (HRSA, 2013). Anticipated workforce supply changes, resulting from an exodus of nursing professionals secondary to retirement, will create a workforce shortage nationally if the incoming supply of RNs is not sufficient to meet and exceed the workforce outflow. Additionally, the retirement of experienced “expert” nurses will leave the workforce with higher percentages of novice nurses, thus compounding the problem of workforce attrition (Buerhaus et al., 2017).

Chronic Disease Burden

One hundred thirty-three million Americans had at least one chronic health condition in 2005, and 63 million had multiple chronic illnesses (Bodenheimer et al., 2009). An aging population contributes to increasing chronic disease prevalence (Bodenheimer et al., 2009). There is a projected 42% increase in the prevalence of chronic disease by 2023 (DeVol & Bedroussian, 2007). This increasing prevalence suggests that the demand for nursing and other health care services will continue to grow.

Health Care System Reforms

The United States has a long history of legislation resulting in significant health care system reforms. Currently, a growing emphasis is on improving patient experience, population health, and reducing health care costs (Institute for Healthcare Improvement, 2019). Ongoing initiatives such as payment reform models aim to foster greater patient outcome accountability by health care organizations and individual providers. Hospital labor costs account for the largest portion of hospital expenditures (Buerhaus, Staiger, & Auerbach, 2009), so it is not unexpected that emerging payment reform models could impact health care labor decisions.

In addition to workforce numbers, demographics and other characteristics of the RN workforce are essential to understand. A growing body of research underscores how RNs impact patient outcomes in hospitals. Higher levels of hospital nursing care delivered by RNs are correlated with lower readmission rates (McHugh et al., 2013); increased patient safety and quality of care (Sloane et al., 2018); increased patient survival/lower mortality (Aiken et al., 2003; McHugh et al., 2016); increased patient satisfaction (Persolja, 2018); and cost savings (Shamliyan et al., 2009). Higher RN

educational levels are associated with better patient outcomes in acute care facilities (Aiken et al., 2003; Blegen et al., 2013). The IOM (2011) recommended that by the year 2020, 80% of registered nurses should hold a baccalaureate degree. Recent national-level projections suggest that the RN workforce as far out as 2025 will fall short of this goal, and therefore further workforce development strategies are needed (Spetz, 2018).

Further, when compared to the populations served, the RN workforce continues to reflect a deficit in diversity. An increase in nursing workforce diversity to achieve health equity for minorities and underserved populations is recommended (National Advisory Council on Nurse Education and Practice, 2013). According to Zangaro et al. (2018), the ethnic and racial diversity of the nursing workforce nationally is growing, but there is still progress to be made. Over the next decades, total U.S. population numbers of non-Hispanic Whites are projected to decrease, and those individuals who identify with two or more races are projected to be the fastest-growing racial or ethnic group. International migration is expected to overtake birth rates in the United States by 2030, which will translate into a larger Asian population in the U.S. (Vespa et al., 2018). Between 2000 and 2015, the number of minority RNs increased by 7.3 percentage points compared to an increase of minorities in the U.S. population by 8.1 percentage points. The RN workforce diversity based on race/ethnicity has changed as follows: a) Hispanic has increased by 2.6 percentage points; b) Black has increased by 2.3 percentage points; c) Asian has increased by 2.1 percentage points; d) other or multiple races have increased by 0.4 percentage point; and e) non-Hispanic White has decreased by 7.3 percentage points (Zangaro et al., 2018).

State-Level Registered Nurse Workforce Data

National-level data analyses of RN workforce supply and demand suggest that research conducted with state-level data is equally important (HRSA, 2017). In 2001, the United States General Accounting Office published the report *Nursing Workforce: Emerging Nurse Shortages Due to Multiple Factors*, which concluded that national-level data are not adequate nor sensitive enough to compare nursing workforce availability across states. Recent HRSA reports conceded that inequitable distributions across states may be masked when analysis and forecasting rely solely on national-level data, as nursing shortages or surpluses are impacted by local conditions (HRSA, 2014; HRSA, 2017). Additionally, the use of alternative national-level data sources and methodologies produce different results. For example, HRSA's 2030 projected RN supply and demand for Alabama are based on models with inputs from the 2012 American Community Survey (ACS), National Nursing Home Survey, and the Behavioral Risk Factor Surveillance System. The HRSA models suggest a surplus of +5,300 full-time equivalent (FTE) RNs in Alabama by 2030. In contrast, another research group created their workforce model utilizing supply inputs from the Bureau of Labor Statistics Current Population Survey (CPS) and demand inputs from Centers for Medicare & Medicaid Services age-based personal health expenditure estimates. That research group projects that Alabama will have an RN shortage in 2030 (Zhang et al., 2018).

There is evidence of an ongoing nursing shortage in Alabama. Druid City Hospital (DCH) Health System, which serves West Alabama through three separate hospitals, recently reported having difficulty finding nurses due to the abundance of open positions in their service area (Enoch, 2017). Data from the Alabama Hospital

Association suggest hospital-employed medical-surgical nurse vacancy rates have tripled between 2011 and 2017 (L. Gibson, personal communication, November 14, 2018). Registered nurses are identified as one of the top demand occupations in Alabama (Center for Business and Economic Research, 2018). These state-level realities suggest that national data used to forecast state supply and demand lack the state-specific context needed for accurate forecasts.

An Aging Population

In Alabama, developing population trends suggest that the demand for health care services delivered by hospital nurses will continue to grow. Persons 65 years and older represented 16.1% of Alabama's population in 2016. That number reflects a steady increase from 13.8% in 2010 (U.S. Census Bureau, 2017). Alabama's population of persons 65 years and older is expected to grow by 42% between 2016 and 2035 (Center for Business and Economic Research, 2018).

Chronic Disease Burden

Public Health Indicators data for Alabama demonstrate the chronic disease burden of the state's population. Alabama has higher prevalence rates of asthma, mortality from diseases of the heart, mortality from stroke, mortality from diabetes, and obesity when compared to U.S. percentages (Alabama Department of Public Health, 2017). One national health ranking report ranks Alabama as 48 out of 50 states for overall health (United Health Foundation, 2019). The aging population and chronic disease burden suggest that, like the rest of the United States, the future demand for nursing services in Alabama will continue to increase (U.S. Bureau of Labor Statistics, 2017).

Today, Alabama's RN workforce reflects 82,571 licensees, but the number of practicing RNs is believed to be lower. An Alabama Board of Nursing survey based upon the National Forum of State Nursing Workforce Center's Minimum Nurse Supply Dataset (MDS, 2016) and disseminated at the time of the 2016 RN license renewal revealed that 12% of the survey respondents were not currently employed in nursing, and an additional 13% of respondents provided no employment information (Alabama Board of Nursing, 2018). Historical data about Alabama's RN workforce before the 2016 license renewal is limited. Between 2005 and 2008, the Alabama Board of Nursing operated the Center for Nursing, supported by legislative funding. A full-time PhD-prepared researcher conducted nursing workforce analyses during that time. State funding cuts in 2009 led to a decision to close the Center for Nursing and thereby served to limit the collection of nursing workforce data by the Alabama Board of Nursing beyond regulatory requirements. With the release of the IOM (2011) report, recommendations were made that the HRSA should collaborate with State Nursing Workforce Centers to improve the collection and analysis of state-level nursing workforce data. Since Alabama did not have a State Nursing Workforce Center actively conducting workforce research, grant monies and collaboration opportunities were missed until the formation of the Alabama Health Action Coalition (AL-HAC).

Supply

Alabama health care leaders from academia, practice, nursing organizations, and insurers joined forces in 2012 to establish AL-HAC and improve the health of Alabamians by focusing on recommendations from the IOM (2011) report. One of the coalition's goals was to create a pathway to gather and analyze nursing workforce data.

This group of stakeholders included representation from the Alabama Hospital Association, Alabama Organization of Nurse Executives, and Blue Cross and Blue Shield of Alabama, among others. With grant support from Robert Wood Johnson Foundation, AL-HAC initiated a collaboration agreement with the Alabama Board of Nursing that resulted in the collection of nursing workforce data with the 2016 nursing license renewals through a voluntary survey (Ratcliffe et al., 2017). Therefore, a mechanism for biennial collection of survey data is now in place to support the ongoing characterization of Alabama's RN workforce supply, which can be used to inform discussions focused on the improvement of health care delivery in Alabama.

Demand

Registered nurse workforce demand data are not currently collected by the Alabama Board of Nursing. The Alabama Hospital Association conducts a survey annually of its members with information received regarding vacancy rates for selected nursing positions. However, the survey is not specifically designed to comprehensively collect data on demand for the acute care RN workforce (L. Gibson, personal communication, December 12, 2017). The most recent *Alabama State of the Workforce Report XII* (Center for Business and Economic Research, 2018) identifies registered nurses as a top-five high demand occupation. However, the analysis relies on a Help Wanted Online Data Series™, which is based on advertised vacancies (Alabama Department of Labor, 2017). This measurement is not sufficient, as a single job vacancy posting could reflect multiple open positions that need to be filled in an organization, especially when the posting is for a frontline nurse position rather than an administrative position. More specifically, there are no comprehensive Alabama RN workforce demand

data, which are collected directly from acute care hospital employers. Therefore, this dissertation surveyed chief nurse executives of Alabama's acute care hospitals to further understanding and characterization of Alabama's demand for acute care RNs.

Study Purpose

The purpose of this study was to characterize the current and future supply and demand of Alabama's acute care registered nurse workforce. The study contributes new knowledge that can be used to make data-driven recommendations informing a successful approach to acute care RN workforce sustainability in Alabama. Workforce planning, educational investments, and health policy decisions in Alabama will be better informed by the knowledge contributed by this study.

Study Aims and Research Questions

The specific aims and research questions for this study are found in Table 1.

Table 1

Specific Aims and Research Questions

Aim 1	To characterize current supply of acute care hospital RNs in Alabama
	RQ 1: How many RNs were licensed and employed in Alabama's acute care hospitals in 2016? in 2018?
	RQ 2: What were the demographics (age, ethnicity, race, gender) of RNs licensed and employed in Alabama's acute care hospitals in 2016? in 2018?
Aim 2	To characterize current demand for acute care hospital RNs in Alabama
	RQ 1: What was the 2019 demand for RNs practicing in Alabama's acute care hospitals?
	RQ 2: What was the 2019 number of RN full-time equivalents (FTEs) budgeted for in Alabama's acute care hospitals?
	RQ 3: What was the number of budgeted RN FTEs unfilled in 2019?
	RQ 4: In what areas (specialties, units) were Alabama's greatest acute care hospital RN staffing needs in 2019?
Aim 3	To estimate the future supply of and demand for acute care hospital RNs in Alabama
	RQ 1: What is the estimated future supply of RNs licensed and employed in Alabama's acute care hospitals in 2 years (2020)? in 5 years (2023)?
	RQ 2: What is the estimated rate of retirement of RNs licensed and employed in Alabama's acute care hospitals in 5 years (2023)? in 10 years (2028)?
	RQ 3: What is the estimated future demand for RNs licensed and employed in Alabama's acute care hospitals in 2 years (2020)? in 5 years (2023)?
Aim 4	To forecast whether future acute care hospital RN supply will meet future acute care hospital RN demand in Alabama
	RQ 1: Will Alabama's acute care RN workforce be sufficient to meet acute care workforce demand in Alabama in 2 years (2020)? in 5 years (2023)?

Introduction of Conceptual Framework

The conceptual framework guiding this study was informed by an integrative literature review (see Figure 1). A review of the published workforce literature revealed that no two groups of published researchers had utilized the same supply and demand framework. In fact, most published nursing workforce supply and demand studies do not identify a framework. For those studies that did identify a framework, significant differences were evident, highlighting use of a conceptual framework as a potential area for improvement in nursing workforce supply and demand studies.

Supply

The supply of the total RN workforce includes RNs who renew their license biennially, RNs who enter the workforce for the first time as newly licensed RNs, and RNs who enter the Alabama workforce through license endorsement. This study focused on RNs licensed in the state of Alabama with active primary employment in an Alabama acute care hospital. FTE supply of acute care RNs can be calculated utilizing data that identify the number of acute care nurses and how many hours per week each nurse reports working. For this study, the number of hours worked were categorized as full-time or part-time and then converted to FTEs based upon that designation. Estimation of the future supply of acute care RNs can be determined through a greater understanding of the current supply, predictable separations (outflow), and patterns of entry for new entrants (inflow).

Demand

Demand in an acute care hospital is affected by many factors. The demand for acute care RNs is commonly understood by vacancy rates and turnover rates. For this

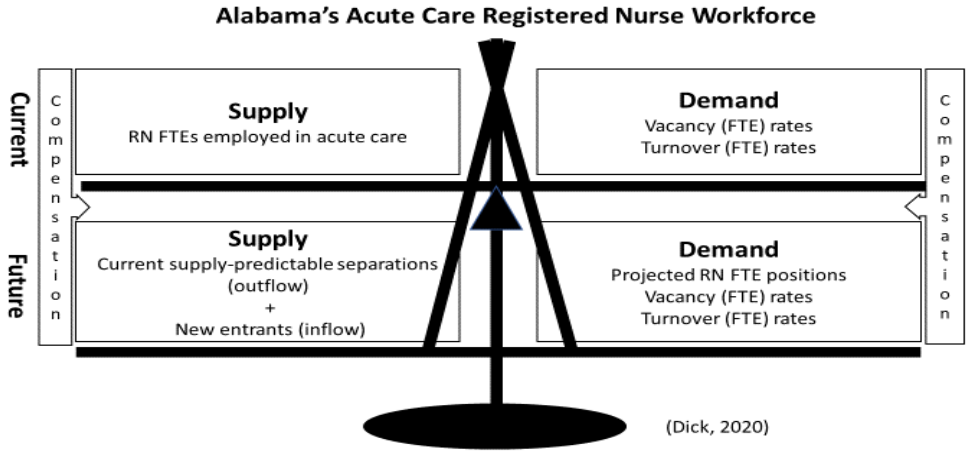
study, demand information was obtained from individual facilities and reported in aggregate at regional and state levels. Estimation of future demand for acute care RNs can be calculated with a greater understanding of aggregate data based on individual facility-projected RN FTE positions and patterns of vacancy and turnover rates.

Compensation

The conceptual model for this study recognizes the impact of compensation as a factor that is associated with both current and future workforce supply and demand. Economists well understand the concept of supply and demand equilibrium in labor markets. Labor market equilibrium reflects efficiency and stability (Borjas, 2016).

Figure 1

Supply and Demand for Alabama's Acute Care Registered Nurse Workforce



Overview of Study Design

The study utilized an exploratory, descriptive design. Descriptive research allows the researcher to describe and document a situation (Polit & Beck, 2017) or population (Brink & Wood, 1998b). Because little is known about the supply and demand of acute

care RNs in Alabama, implementing a descriptive study addressed this knowledge gap. In addition, data analysis identified factors affecting future supply and demand, such as recent annual numbers of new entrants and future anticipated attrition from the workforce. This data provided the opportunity for trending and short-term estimations of future workforce needs. Findings will highlight the importance of supply and demand research as necessary to workforce sustainability.

Definitions

For this study, the following terms are defined:

Active License

A license that is up to date on all licensure and/or renewal requirements (National Forum of State Nursing Workforce Centers, 2009).

Acute Care Hospital

Short-term federal, state, or private hospital providing inpatient services and emergency outpatient services (e.g., emergency department) at the same location (National Forum of State Nursing Workforce Centers, 2009).

Acute Care Registered Nurses in Direct Care

RNs employed by a hospital who provide care to patients utilizing the nursing process, which includes assessment, nursing diagnosis, planning, implementation, and evaluation of care (Florida Center for Nursing, 2012; alternatively called bedside or frontline nurses.

Acute Care Registered Nurses in Indirect Care

RNs employed by a hospital who are not providing direct care to patients, such as nurse administrators (Florida Center for Nursing, 2013).

Advanced Practice Registered Nurse

A nurse who has obtained a license to practice as an advanced practice registered nurse (APRN) in one of the four APRN roles: certified registered nurse anesthetist (CRNA), certified nurse-midwife (CNM), clinical nurse specialist (CNS), or certified nurse practitioner (CNP) (National Forum of State Nursing Workforce Centers, 2009).

Demand

Total number of RN FTE hours that acute care employers are willing to hire (Buerhaus, Staiger, & Auerbach, 2009).

Educational Preparation

Highest degree earned in nursing (i.e., diploma, ADN, BSN, MSN, etc.).

Employed in Nursing

An RN who receives compensation for work that requires licensure and educational preparation as a registered nurse (National Forum of State Nursing Workforce Centers, 2009).

Experience (Years)

Number of years since initial licensure.

Full-Time

RN position assigned 1.0 FTE as defined by the employer (National Forum of State Nursing Workforce Centers, 2009) or reflective of the number of hours worked in a typical week ≥ 33.

Full-Time Equivalent (FTE)

A calculation standardizing number of labor hours per week. For the purposes of this study, 1.0 FTE = RN position requiring ≥ 33 clock hours/week and 0.5 FTE = RN position requiring ≤ 32 clock hours/week.

Licensed by Endorsement RN

RNs who already have an active license in another state and have been newly approved for licensure and practice in the state of Alabama by the Alabama Board of Nursing within the last year.

New Positions

Positions that do not currently exist but are expected to be created over the next year (Florida Center for Nursing, 2013).

Newly Licensed RN

RNs who have passed the NCLEX-RN examination within the last year and were assigned a license number for the first time.

Part-Time RN

RN position assigned 0.5 FTE as defined by the institution (National Forum of State Nursing Workforce Centers, 2009) or reflective of the number of hours worked in a typical week ≤ 32.

Per Diem

An arrangement in which the RN is employed directly on an as-needed basis and usually has no benefits (National Forum of State Nursing Workforce Centers, 2009).

Registered Nurse (RN)

An individual who holds a current license to practice within the scope of professional nursing in at least one jurisdiction of the United States. Includes diploma RNs, associate degree nursing RNs (ADNs), and bachelor of science in nursing RNs (BSNs) (National Forum of State Nursing Workforce Centers, 2009).

Retirement

Voluntary cessation of paid employment as a registered nurse.

Separations

The number of RNs who left the organization in a specified time frame. This includes voluntary and involuntary terminations or separations. This does not include within-organization transfers, per diem workers, contract/temporary labor, or students in training (National Forum of State Nursing Workforce Centers, 2009).

Shortage

Quantity demanded is greater than quantity supplied (Mankiw, 2018).

Supply

Total number of RN FTE hours that acute care RNs provide to acute care employers (Buerhaus, Staiger, & Auerbach, 2009).

Surplus

Quantity supplied is greater than quantity demanded (Mankiw, 2018).

Summary

This chapter provided an overview of an identified research problem, background, and significance of the problem. In addition, the chapter presented study aims, research

questions, a conceptual framework overview, study design, and definitions of selected terms that were used in the study. A lack of state-level research currently limits the characterization of RN supply and demand in Alabama's acute care hospitals. National-level data are recognized as having limitations, and state-level workforce data are needed to guide nursing workforce planning, health policy decisions, and educational investments. The need for nursing services is expected to increase demand in Alabama, thus supporting the necessity of the study to generate knowledge. As Rumelt (2011) noted, "A great deal of strategy work is trying to figure out what is going on. Not just deciding what to do, but the more fundamental problem of comprehending the situation" (p. 78).

This study characterizes the current supply and demand of acute care hospital RNs in Alabama and provides short-term estimates of future supply and demand for acute care hospital RNs in Alabama. Finally, data-driven recommendations are made to inform a successful approach to acute care RN workforce sustainability in Alabama. An integrative review of the literature that supported the study follows in Chapter Two.

CHAPTER 2

LITERATURE REVIEW

The purpose of this chapter is to provide an integrative review of literature relevant to registered nurse (RN) workforce supply and demand. The review supports the need for further study involving state-level data collection and analysis as a contribution to this area of research. The literature reviewed primarily represents national-level nursing workforce research. There are few state-level studies published, and there is a lack of research specifically relevant to the nursing workforce in the state of Alabama. Related concepts of interest integral to understanding workforce supply and demand will be addressed along with an exposition of the conceptual framework.

The Basis for the Study

Registered nurses comprise the largest manpower component of the health care workforce in the United States. National-level estimates of the workforce size, along with predictions of future growth, vary based upon the source of information. The Health Resources and Services Administration (HRSA) estimates that there are around 3.9 million licensed RNs in the United States, with approximately 83% of licensed nurses holding a nursing-related job (HRSA, 2019). Other sources report slightly different national-level estimates. For example, the U.S. Bureau of Labor Statistics estimates the employed RN workforce to be around 2.9 million (U.S. Bureau of Labor Statistics, 2019). This number is relatively close to the HRSA (2019) numbers of RNs (difference of 300,000 RNs) who hold nursing-related jobs. Other researchers such as Budden et al.

(2016) reported an estimated 3.8 million active RN licenses a full two years earlier, with approximately 3.1 million actively employed in a nursing-related job. Despite what might be interpreted as a national-level stable and growing RN workforce, there remains a question about the adequacy of this workforce to meet the increasing demands of the U.S. health care system. In fact, the 2011 Institute of Medicine (IOM) report *The Future of Nursing: Leading Change, Advancing Health*, stated that the nursing workforce "may never have the optimum number to meet the needs of patients" (p. 270).

Registered nurses work in a variety of health care settings and thus have vital roles in the delivery of health care services (Buerhaus & Staiger, 1999). Higher nurse-to-population ratios are associated with higher state health rankings (Bigbee, 2008). Traditionally, hospitals have employed the largest percentage of RNs (Buerhaus, 1999; Duvall & Andrews, 2010). In 2013, 56% of registered nurses reported a hospital as their primary employment setting (Budden et al., 2013), while a slightly higher percentage of RNs (59.9%) reported the same in 2018 (HRSA, 2019).

As the role of the RN has evolved and advances in health care delivery have developed, the critical role that RNs play in ensuring quality health care has become increasingly prevalent in the literature. Higher levels of nurse staffing in acute care settings have been shown to result in better patient outcomes such as lower mortality rates (Aiken et al., 2017; Cho et al., 2003; McHugh et al., 2016; Needleman et al., 2002), higher patient satisfaction (Aiken et al., 2017), decreased hospital length of stay (Kutney-Lee & Aiken, 2008; Needleman et al., 2002), reduced costs (Xue et al., 2015), and improved overall quality of care (Aiken et al., 2017).

For decades, cyclical supply and demand imbalances have occurred within the U.S. health care delivery system (Aiken, 1989; Duvall & Andrews, 2010; Reno, 2002; Spetz, 2004). When supply is less than demand, a nursing shortage occurs. Historically, nursing shortages have contributed to hospital closures, reduction of services, and rising death statistics, often requiring government action to abate crises (Reno, 2002). In 2001, hospitals experienced a shortage of multiple types of professional hospital personnel, with RNs comprising the majority (75%) of the total workforce shortage. As a direct result, 41% of hospitals reported emergency department overcrowding, 28% reported a reduced number of staffed beds, 26% reported necessary emergency department diversions, 22% reported increased wait time for surgeries, 15% reported canceled surgeries, and 14% reported reduced outpatient services (American Hospital Association, 2001). Sixty-eight percent of chief nursing officers (CNOs) and 79% of hospital RNs who experienced effects of a nursing shortage during that time perceived nursing shortages as a major problem for quality care, citing negative effects on team collaboration, detection of patient complications, patient safety, and actual time for nurses to spend with patients (Buerhaus et al., 2005). These and other adverse effects of a nursing shortage underscore the critical need for attention to workforce supply and demand.

Workforce planning is a continual process used to align the needs and priorities of stakeholders with those of an institution's workforce to ensure legislative, regulatory, service, and organizational objectives are met. Nursing workforce forecasting and planning enable evidence-based workforce development strategies. Inadequate nursing supply combined with increasing demand and a lack of nursing workforce planning

create the "perfect storm" for a health care disaster (Bleich & Hewlett, 2004). Accurate and ongoing workforce monitoring is needed to address potential shortages and surpluses (Smith, 2003). Systematic collection of nursing workforce supply and demand data along with patient outcomes data is needed to build a case for evidence-based resource investment in nursing (Kimball, 2004). Keeping an active watch on economic indicators and nursing workforce demographics will decrease hospitals' risk of unanticipated insufficient nursing workforce resources (Buerhaus & Auerbach, 2011). Additionally, a clear assessment of when and why many older nurses are leaving the profession is necessary to determine the potential for future shortages (AACN, 2011).

A lack of state-level nursing workforce supply and demand research in Alabama places the state in a precarious position during this time of health care reform. Ongoing research is needed to ensure the right number of nurses are trained and prepared to handle the challenges we face in providing health care for the aging population, especially critical to an area of the country with such a high prevalence of chronic disease and an aging nursing workforce. This study contributes findings that can be referenced by state policymakers, health care organizations, nursing education programs, and others when making decisions that impact Alabama's health care system.

Analysis of the Literature

U.S. Nursing Supply and Demand in a Historical Context

Nursing supply and demand have an extremely complicated relationship that is recorded in the literature spanning several decades. Organizational, societal, and personal factors have been recognized repeatedly as contributors to the supply and demand continuum. As Spetz (2004) observed, "Demographics of the nursing workforce affect

the supply of nurses in a profound way" (p. 416). Additional factors suggested as affecting supply include social preferences for nursing as a career, nursing education capacity, RN separations from the workforce, wages, and non-wage income (Buerhaus, 1998). Deloughery (as cited in Reno, 2002) stated: "Recruitment, retention, education, and practice of nurses are affected by the demand for services, reimbursement systems, prevalent health care problems, and research findings" (p. 64). Population growth, patient demographics, technology advancements, economic forces, and regulatory policy impact the dynamics of the health care marketplace and thus influence workforce demand (Buerhaus, 1994; Spetz, 2004). This list of factors affecting nurse supply and demand is partial at best. Variability in interpretation and measurement of these and other factors adds to the complexity of research conducted to describe and forecast the supply and demand of the nursing workforce. For example, in 1989, 75% of hospitals reported a shortage of nurses, but the Department of Health and Human Services reported that there was an equilibrium between supply and demand (Aiken, 1989). Aiken posited then that federal estimates were based on models estimating national requirements rather than actual employer demand and thus did not account for changes in a number of nursing positions offered by hospitals, higher patient acuity, and other patterns of hospital care.

One factor of great concern in nursing supply and demand research is that health care reimbursement patterns driven by cost-containment have historically depressed nurses' wages, which trend with lower nursing education enrollment (Aiken, 1989). Trends reflecting employment growth for RNs in hospitals between 1981 and 1983 reflected a higher employment and wage rate in states with low health maintenance organization (HMO) enrollment, suggesting that as cost-containment through HMOs and

other payment models spread, the RN workforce would experience fewer employment opportunities in acute care coupled with falling earnings (Buerhaus, 1998). Indeed, cost-containing payment models (like managed care and implementation of Medicare's Prospective Payment System) in the 1980s resulted in the restructuring of many hospitals (Lee & Alexander, 1999). These payment models translated into payors exhibiting tighter control over hospitals, which caused a reduced demand for hospital inpatient services (Lee & Alexander, 1999). Changing hospital structures with a focus on reducing costs and greater efficiency in care delivery did result in some substitution of RNs with licensed practical nurses (Aiken, 1989). However, the 1980s and 1990s were also affected by periods of economic volatility, increased hospital competition, and higher-acuity patients in hospitals (e.g., the number of intensive care unit beds doubled), which exerted their effects on employment of RNs (Aiken, 1989). In 1986, vacancy rates for hospital RNs exposed a new nursing shortage (Buerhaus, 1994), and wage growth began to be seen (Spetz, 2004).

In the early 1990s, the hospital-employed vacancy rates began to drop as an economic recession drove many unemployed RNs back to employment, and already employed nurses increased hours of work. This workforce shift reflected the economic driver of labor force participation, including non-wage income, such as spouse earnings (Buerhaus, 1994). By 1994, it appeared that the U.S. was not only recovering from a shortage, but potentially even on the cusp of experiencing an excess of RNs (Buerhaus et al., 2000b).

By 1998, reports of severe nursing shortages resurfaced, and a new concern began to grow based upon a unique pattern of age distribution in the nursing workforce, which

suggested a future supply problem (Buerhaus, 1999). HRSA national data reported that the mean age of RNs increased from 40.3 in 1980 to 44.3 in 1996 (Buerhaus, 1998). The Bureau of Labor Statistics' data reflected slightly different age averages between 1983 and 1998 but also reflected an age increase of 4 years among *working* RNs (Buerhaus et al., 2000a). Staiger et al. (2000) reported that during that same time frame, the average age of hospital-based RNs increased by 5.3 years. Forecasts suggested that the average age of RNs would continue to increase, with an expectation that over 40% of the workforce would be over 50 years of age by 2010 (Buerhaus et al., 2000a). The increasing average RN age, coupled with a decline in younger women choosing nursing as a career (attributed by researchers to an expansion of career opportunities for women), suggested that a persistent and severe shortage would likely occur. This shortage was expected to place access to and quality of care at risk (Staiger et al., 2000). Not only would there be an inability to produce an adequate number of nurses to replace those expected to retire from the workforce around 2020, but the U.S. would also realize an increase in nursing workforce demand already projected to result in a 20% (or approximately 400,000 RNs) shortfall (Buerhaus et al., 2000a; Staiger et al., 2000).

Another issue important to nursing supply and demand is nursing education. In 2000, research conducted by Auerbach, Buerhaus, and Staiger identified a trend of increasing enrollment for nursing education in associate degree programs, while enrollment in baccalaureate programs remained relatively unchanged. At that time, graduates from associate degree programs were approximately five years older than those graduating from baccalaureate programs and thus further contributed to an older workforce (Auerbach et al., 2000). These researchers concluded that the aging workforce

was due to a cohort effect and continued to draw attention to the lack of younger cohorts (age early 20s) entering the profession.

Hospitals in 2001-2002 responded to pressures of demand for delivery of health care services, which translated into a surge of employment and wage increases for RNs. Notable characteristics of the hospital-based RN workforce at that time were: predominantly married, over age 50, and increasingly foreign-born RNs (Buerhaus et al., 2007; Buerhaus et al., 2003; Buerhaus et al., 2004). From the perspective of workforce supply, nursing education programs reported increasing enrollments during this time, but education capacity limits exacerbated the supply problem as thousands of potential nursing students were turned away (Buerhaus et al., 2004; Buerhaus, 2005).

In 2007, Auerbach, Buerhaus, and Staiger identified that younger cohorts were unexpectedly entering nursing education programs at a faster rate. Hospital-based RN employment of these cohorts increased the overall demand for RNs between 2002 and 2009. The production of new nurses began to offer some hope for the growth of the RN workforce (Auerbach et al., 2011; Buerhaus & Auerbach, 2011). However, the demographics of the workforce continued to reflect RNs over age 50 as the fastest-growing nursing workforce age group. As noted previously, most nurses (70%) were married females, and a substantial number of nurses were foreign-born (Buerhaus, Auerbach, & Staiger, 2009).

In 2010, study findings determined that nurses ages 35 and younger continued to enter the labor market at an accelerated rate. Thus, hospital RN employment continued to grow within this age group (Buerhaus & Auerbach, 2011). This unexpected trend fed a model-based projection that if this pattern of entry into the labor market continued, a

steady increase in the RN workforce would occur through 2030, effectively mediating the retirement of baby boomers (Auerbach et al., 2011; Auerbach et al., 2015b). However, on the demand side, vacancy rates for hospital-based nurses increased from 5.5% in 2009 to 17% in 2013 (AMN Healthcare, 2013).

The national cyclical patterns, as presented above, demonstrate the dynamic nature of nursing workforce supply and demand. As state-level data collection and evaluation varies in consistency, information about historical supply and demand patterns for every individual state is not available. In Alabama, there is limited historical or current research-based evidence describing RN workforce supply and demand. Anecdotal reports suggest a current nursing shortage across the state. Based upon the national nursing workforce history reported in the literature, ongoing state-level data collection and analysis of nursing workforce supply and demand are needed.

Registered Nurse Workforce Supply

Recent Trends in Supply

In 2013, HRSA reported that the number of U.S. RNs grew by 24.1% in the 2000s, which exceeded population growth. Specifically, HRSA (2014) reported that the number of new RN graduates increased from 68,000 in 2001 to 150,000 in 2012 and the number rose again in 2013. Growth in the entry to the nursing workforce during the last decade has mainly been attributed to an increase in media attention and the dynamic response of nursing education institutions to increase student capacity (Auerbach et al., 2013; Buerhaus, Auerbach, & Staiger, 2014).

Utilizing 2012 workforce data and their own Health Workforce Simulation Model, which HRSA acknowledges employs significant and perhaps misleading

assumptions, HRSA projected a 21% increase in full-time equivalent (FTE) RN positions from 2,897,000 in 2012 to 3,509,000 in 2025 (HRSA, 2014). The report predicted a growth in RN supply that would outpace predicted growth in demand in 34 states. This means that HRSA expects an RN surplus to occur in most states by 2025. Alabama was listed as one of the states with predicted supply being 14,400 RN FTEs higher than predicted demand (HRSA, 2014).

Patterns of unequal distribution of the RN workforce, such as RN shortages in some regions and surpluses in other regions of the U.S., have received increased attention (Auerbach et al., 2013). HRSA (2014) acknowledged that projections made at the national level could mask state-level and regional RN workforce imbalances. Other factors could also contribute to inaccurate predictions, including changing health care delivery models, evolving reimbursement for health services, higher disease burden, aging of the population, regional economic conditions, and changes in the number of entrants to nursing education programs (HRSA, 2014).

HRSA updated nursing workforce supply and demand projections in 2017 using 2014 data as the baseline. These projections continued, however, to rely on a model with acknowledged limitations. Those limitations included an assumption of equilibrium between supply and demand in 2014 (HRSA, 2017). The updated report continued to project national-level growth in RN supply for 2030 to just under 4 million RN FTEs. This growth would exceed the 2030 national-level demand projected at just over 3.6 million RN FTEs. Highlighted again in this report, however, was that state-level distribution might be a more significant problem than the national-level data revealed. Local conditions affect nurse shortages and surpluses (HRSA, 2017). The final report

found substantial differences between projected supply and demand between states. In the 2017 HRSA report, the state of Alabama is predicted to have a 6.6% RN surplus (5,300 RN FTEs) by 2030.

In stark contrast to the HRSA workforce forecasts, Juraschek et al. (2012) forecast that nursing shortages will grow across the U.S., and states in the South and West will have the most substantial shortages in 2030. They predict a shortage of 420,691 RNs in the South and 358,637 in Western states. A subsequent forecast in 2017 continued to predict shortages of RNs in the South and West with only a small decrease in shortage estimates for 2030, i.e., a shortage of 248,964 RNs in the South and 241,434 RNs in the West (Zhang et al., 2017). These differences between shortage and surplus estimates among researchers demonstrate the complexity in forecasting nursing workforce numbers. Clearly, different forecasting models provide different results.

The Impact of Geographic Mobility on Supply

Registered nurse supply has been shown to be affected by local geographic supply (Blegen et al., 2008; Kovner et al., 2011). Many nurses have family considerations that translate into an inability to relocate (Aiken, 1989). A majority (88%) of newly licensed RNs seek initial employment in the same state where they earn their first nursing degree, and 52.5% work within 40 miles of the high school they attended (Kovner et al., 2011). As HRSA's (2017) report noted, "Nurses tend to practice in states where they have been trained" (p. 6).

According to the National League for Nursing (NLN), the Southern region of the United States had one of the highest percentages of RN educational programs nationwide in 2012 (NLN, 2013). HRSA (2013) reported that Alabama's first time NCLEX-RN test-

takers in 2010 reflected 71.0 RNs per 100,000 population, which was the second-highest rate in the nation. In the same HRSA report, Alabama had approximately 960 RNs per 100,000 population, which ranked the state 26th in per capita RNs in the U.S. Limitations in the interpretation of these data are essential to recognize. These data alone cannot determine whether an adequate supply of RNs exists. One notable limitation of the evaluation is that it does not consider state-level demand (HRSA, 2013). State-level considerations such as population characteristics, prevalence of disease states, health care utilization, and other important factors are beyond the scope of their report. Currently, data to understand Alabama's RN workforce geographic mobility are not available in the literature, and this area of inquiry does not appear to have been studied.

The Impact of Demographics on Supply

Age

As previously noted, the aging of the nursing workforce has been a topic of concern in the literature for almost two decades. Baby boomer nurses (born between 1946 and 1964) have comprised a large proportion of the nursing workforce since the cohort began entry into the nursing profession in the 1970s and 1980s. As this generation has aged and continued to work in nursing, attention to the benefits of retaining these older nurses, along with actively addressing employment challenges experienced by this significant portion of the nursing workforce, has become increasingly important. Because the retirement of such a large portion of the RN workforce impacts the workforce supply, literature considering this cohort has increased in recent years. Thus, aging of the workforce is considered an important part of the RN workforce supply and demand discussion.

Recent research found that the average age of RNs in the U.S. decreased only slightly over the last few years, moving from age 50 in 2013 (Budden et al., 2013) to age 48.8 in 2015 (Budden et al., 2016). National-level data also suggest the average hours worked by RNs drop significantly after age 60 (HRSA, 2013). A Robert Wood Johnson Foundation white paper authored by Bleich et al. (2006) highlighted the importance of retaining older workforce members who bring experience and wisdom to bedside care. The loss of these nurses from the RN workforce raises questions about the impact that losing significant expertise and experience will have on workforce supply and patient outcomes (O'Brien-Pallas et al., 2004). In 2013, HRSA reported that approximately one third of the nursing workforce is over age 50 and emphasized that this should be a key consideration in workforce planning. "Depending on the retirement decisions of this older cohort…sudden spikes in retirement may exacerbate geographic and facility-level nursing shortages" (HRSA, 2013, p. 22). In 2018, the National Nursing Workforce Survey team began reporting the median workforce age instead of the average age. The most recent data collected (Smiley et al., 2018) suggested that the RN median age in 2017 was 53 years and that 51% of nurses were older than age 50. Although the researchers stated this was consistent with survey results from 2015, they also noted that there was a 2.2 percentage point increase from 2015 for nurses who report age as 65 years and older (Smiley et al., 2018).

As the average age of RNs has climbed, so have concerns about the increasing physical and psychological demands placed on nurses due to higher patient acuity levels, nurse turnover, and poor work environments. Nurses' work environments present both physical and psychological stress (Aiken, 1989). Liu et al. (2016) conducted research

with a sample of new nurses (n = 162) and found that work-related fatigue is a significant determinant of nurse intent to leave. In the workplace, nurse managers and medical staff consider older nurses as formal and informal mentors when new graduates are onboarded to the inpatient work environment (Santos et al., 2003). Combining responsibilities of direct care, oversight of unit activities, and mentoring of younger nurses creates stress from multiple job demands (O'Brien-Pallas et al., 2004). Research has identified significant stress associated with role overload (job demands exceed resources), role insufficiency, role ambiguity, and shuffling role boundaries among baby boomer nurses (Santos et al., 2003). Additionally, outside of the workplace, these older nurses often live with multi-generational family commitments, which include adult caregiver responsibilities (Rosenfeld, 2007; Santos et al., 2003).

Physical limitations and health conditions that develop progressively with aging also require consideration for baby boomer nurses (Duffield, Graham, Donoghue, Griffiths, Bichel-Findlay, & Dimitrelis, 2014). This issue underscores the need for employers to consider work allocations and work environment approaches meant to minimize stressors and promote retention of these older nurses (O'Brien-Pallas et al., 2004). Creating a more ergonomic work environment is suggested as one way to support retention of nurses approaching retirement age (Bleich et al., 2006; Santos et al., 2003), along with the creation of an organization culture that offers flexible scheduling (Bleich et al., 2006; Cohen, 2006; Rosenfeld, 2007), benefits, recognition, and salaries that reward experience (Bleich et al., 2006; Cohen, 2006). Kirgan and Golembeski (2010) conducted a qualitative study identifying strategies essential to retain these more experienced nurses at the bedside. Strategies recommended include: (a) appreciation, (b)

respect, (c) flexibility in schedules and roles, (d) staffing adequacy, and (e) socialization support through group learning opportunities (e.g., retirement planning).

Compared to other regions in the U.S., national-level research reports the Southern region of the United States has a more substantial proportion of younger RNs and a smaller proportion of older RNs (HRSA, 2017). This implies that impending retirement of older RNs from the workforce in the South will not be as critical to the total RN workforce supply numbers unless other regions effectively recruit RNs away from the South (Auerbach et al., 2017a; Buerhaus et al., 2013).

The Alabama Health Action Coalition (AL-HAC) reported that the average age of all licensed RNs in Alabama in 2016 was approximately 46 years (AL-HAC, 2017). Information specific to the ages of Alabama's acute care RN workforce has not been reported, indicating another state-level knowledge gap of importance to be addressed.

Gender and Ethnicity

Greater diversity in the nursing workforce has the potential to improve access to and quality of care for minority and underserved populations (HRSA, 2013). In 2013, the National Advisory Council on Nurse Education and Practice (NACNEP) reported to the Secretary of the Department of Health and Human Services and the U.S. Congress that "the United States is far from achieving the goal of a health workforce that mirrors the nation's diverse population" (p. 3).

National-level data show that the nursing profession is overwhelmingly comprised of non-Hispanic White females, which is notably different from most other occupations in the U.S. (Budden et al., 2016; Budden et al., 2013; HRSA, 2013). Females represent an estimated 93.4% of the national RN workforce while males represent 6.6%;

80.7% of RNs are White/Caucasian, 6.2% Black/African American, 7.7% Asian, 5.3% Hispanic/Latino, and 4.6% report affiliation with other or two or more races (Smiley et al., 2018). Minority student recruitment has been identified by several leading organizations (American Hospital Association, Robert Wood Johnson Foundation, Joint Commission, and the Association of Academic Health Centers) as a necessity to address the lack of diversity in the nursing workforce (AACN, 2017).

Between 1996 and 2016, the percentage of minorities enrolled in U.S. RN nursing education programs increased only minimally. Enrollment by Black/non-Hispanic students increased from 9.4% to 10.8%; Hispanic students from 3.5% to 8.1%; Asian or Pacific Islander students from 4.0% to 5.5%; and the percentage of students classified as other/missing/unknown has fluctuated but is now at 4.5% (NLN, 2017). RN nursing education and graduate nursing education programs have continued to report that a majority of students are female, accounting for approximately 85%-87% of total enrollment (NLN, 2017).

AL-HAC (2017) reported that in 2016 females represented about 89.7%, and males represented 10.3% of all licensed RNs in Alabama. Eighty-one percent of the licensed RN workforce were White, 15.4% were Black/African American, and the other races represented a mere 2.9% of the workforce. Although the Alabama percentages published reflect a higher percentage of Black/African Americans than reported on a national level, there is still a need to address the lack of diversity. There is currently no published report that describes the ethnicity and race characteristics of Alabama's acute care RN workforce, thus providing an opportunity for further state-level research to address the knowledge gap.

The Impact of Education on Supply

Educational capacity impacts the nursing workforce supply. Conversely, employer hiring guidelines (such as preferred or required degree) and non-wage educational benefit policies (such as tuition reimbursement) are impacted by nursing supply and demand (Pittman et al., 2013). As previously discussed, nursing education programs have responded admirably during nursing shortages to increase nurse supply. However, nursing education programs also suffer from resource shortages, most notably faculty shortages (Allen, 2008), resulting in capacity constraints. Bottlenecks in the education system create a smaller pipeline for nurse supply (Auerbach et al., 2011).

Between 2012 and 2016, the percentage of qualified RN program applicants who were denied admission to RN education programs decreased for associate degree in nursing (ADN) programs from 45% to 35%, increased for diploma programs from 18% to 28%, and slightly decreased for BSN programs from 36% to 33% (NLN, 2017). The main obstacles to the expansion of educational capacity include lack of faculty, classroom space, and clinical placements (NLN, 2017). Between 2012 and 2016, RN programs reporting a lack of faculty as an obstacle to increasing enrollment decreased from 30% to 26%, and a lack of classroom space decreased from 10% to 8%. However, the lack of clinical placements remained a significant obstacle, as evidenced by a decrease of only a single percentage point, from 44% to 43% (NLN, 2017).

The IOM (2011) recommendations for seamless education progression, a more highly educated nursing workforce, and greater evidence of interdisciplinary learning provided the impetus for several recent nursing education changes. One of the most recognized recommendations resulting from the IOM report is the educational

preparation goal of obtaining a workforce that reflects at least 80% baccalaureate-prepared (BSN) or higher degree RNs by 2020. This recommendation supports the demands of contemporary health care systems now providing higher acuity care and is convincingly supported by research that demonstrates having a higher percentage of BSN-prepared RNs on staff results in better patient outcomes.

Decreases in patient readmissions for pneumonia (McHugh & Ma, 2013), shorter lengths of stay for patients with severe mental illness (Kutney-Lee & Aiken, 2008), decreased patient mortality rates (Aiken et al., 2003; Estabrooks et al., 2005; Kutney-Lee et al., 2013), and decreased failure to rescue rates (Aiken et al., 2003) are just a few of the patient outcomes that have been found to be associated with BSN and higher nurse education levels. Blegen et al. (2013) determined that as RN education levels increased in hospital nursing staff, lower rates of congestive heart failure mortality, health care-acquired pressure injury, failure to rescue, and deep vein thrombosis/pulmonary embolism were observed. Additionally, the length of stay decreased. Yakusheva et al. (2014) found that patients receiving 80% or more of their care from a BSN-prepared nurse had lower mortality rates, lower odds of readmission, and a shorter length of stay.

In 2013, HRSA reported that about 55% of the nation's licensed RN workforce held a BSN or higher degree. This finding seemed to suggest a slow but promising trend. The number of BSN-prepared candidates taking the National Council Licensure Exam-RN (NCLEX-RN) had essentially doubled over the last decade. An increase in RN-BSN graduates (86.3% increase) and graduate nursing programs (67% increase) was realized between 2007 and 2011 (HRSA, 2013). However, most RN candidates (60%) in 2011 were still graduates of a diploma or ADN program (HRSA, 2013). Thus, despite this

apparent growth in BSN and graduate nursing degrees, HRSA concluded that the slow growth in educational progression would translate into a time frame of several decades before the IOM 80% BSN recommendation could be achieved.

In 2017, the state of New York became the first state to pass legislation aimed to increase the state's BSN saturation. The law requires an RN entering the workforce with less than a BSN degree to obtain a BSN within the first 10 years of practice (Fotsch, 2018; Zittel, 2018). Lobbying for the passage of this legislation was a 15-year process (Zittel, 2018). This legislation was seen as historic, but required follow-up legislation to provide a temporary exemption for nurses who are denied access to a bridge program due to lack of academic institutional capacity (Fotsch, 2018).

Aiken et al. (2009) have shown that initial educational preparation of nurses at the BSN entry level supports graduate-level academic progression. These researchers performed an analysis of data obtained from nurses entering the workforce between 1970 and 1994. They found that three times more of the BSN-prepared nurses advanced to graduate-level education as compared to nurses with initial ADN preparation. The authors posit that a shortage of faculty and other advanced practice nurses can be attributed to the lack of a unified strategy to graduate a more significant number of BSN-prepared nurses.

Of further interest to researchers is an attempt to ascertain whether employers are showing a preference for hiring BSN-prepared RNs. Goode et al. (2001) surveyed academic health center CNOs ($N = 44$) and found that, on average, these centers reported staffing with 51% BSN-prepared nurses but desired a 71% BSN workforce. An increase in nurses holding graduate degrees was also desired. Forty-three percent of the hospitals

provided salary differential, most often based on a clinical ladder program that recognized education level and expanded roles. Seventy-one percent of respondents reported a difference in clinical practice between BSN and ADN graduates. BSN-prepared nurses were believed to demonstrate greater critical thinking skills, leadership skills, communication skills, patient-teaching skills, and professional behaviors (Goode et al., 2001). In contrast to the study by Goode et al. (2001), Leroy et al. (2014) found that nurse managers believed clinical performance was based more on individual characteristics than a degree earned and that there were no differences in professional behaviors between ADN and BSN nurses.

Auerbach et al. (2015a) reported a growing employment preference for BSN-prepared RNs by hospitals nationally. Additionally, the American Association of Colleges of Nursing (AACN) surveyed schools offering BSN or higher nursing education programs in 2017. Deans from these programs ($N = 586$) reported that 49% of employers in their regions required a BSN for new hires, while 86.3% expressed a strong desire for BSN graduates (AACN, 2017). Pittman et al. (2013) surveyed a sample of members of the American Organization of Nurse Executives ($N = 477$). They found that almost 80% of the nurse leaders reported that their institution required or preferred hiring BSN-prepared nurses. Ninety-four percent reported working for an institution that offered some form of tuition reimbursement. However, only 25% reported that their institution offered a pay differential based upon educational degrees.

From another perspective, the Center for Advancement of Healthcare Professionals (2015) released survey findings from 9,000 RNs that showed two unexpected converging trends. The upcoming anticipated wave of retirements by older

nurses appears set to coincide with other nurses (49%) planning to pursue higher degrees. Potentially significant also is that younger nurses (30% of those surveyed) were planning educational progression to pursue advanced practice nursing roles or other career opportunities. This interest in education progression has the potential to accelerate the exodus of younger nurses from the bedside care positions. Therefore, the promotion of higher levels of education within the nursing profession may inadvertently intensify the shortages seen in acute care RN positions involving direct patient care (Faller & Gogek, 2016).

There are currently no publicly available data summarizing the details of the capacity of Alabama's nursing education programs. Programs submit confidential annual reports to the Alabama Board of Nursing. There is also only anecdotal information on acute care hospital employer hiring preferences and benefits packages for different levels of nursing education. This lack of knowledge provides further opportunity to explore state-level employer hiring preferences.

The Impact of Intent to Leave on Supply

RN intent to leave is present in the literature as both intent to leave the profession and intent to leave the current job. Intent to leave the profession impacts nursing supply, whereas intent to leave the current job more directly impacts an individual organization's nurse demand. Related concepts of recruitment, turnover, attrition, and retention are often embedded within this extensive body of literature.

Intent to leave the profession may be due to multiple factors. Research has identified individual and organizational characteristics that inform decisions to leave the profession, and these characteristics have also been related to intention to leave hospital

employment (Leineweber et al., 2016). The current study focuses on RNs reporting intent to leave acute care employment due to retirement or other unspecified reason(s). However, as the literature shows, nurses may choose to contribute to the workforce even after official retirement. This literature review includes an overview of other factors that may contribute to the intent to leave the profession in addition to retirement. Most nurse retirement behavior studies have been conducted outside of the United States (Nooney, Unruh, & Yore, 2010). With 48% of the nation's workforce being more than 50 years old (Alexander, 2018), understanding nurses' intent to leave the profession is an essential consideration in workforce planning.

Palumbo et al. (2009) found a mean age of 63.9 years for planned retirement among a convenience sample of 583 RNs. However, there was variability among the respondents on the level of planned contributions to the nursing workforce pre- and post-retirement. Overall, the time respondents planned to keep working as RNs was lower than the time respondents intended to keep working in general (a decrease of approximately 1.5 years). Organization and position loyalty were not evident in this sample. Organizational commitment to recruitment and retention of nurses greater than age 50 was moderate, with a drop in organizational commitment perceived as nurses reach ages greater than 60. Interestingly, a full 80% of the study participants responded "yes," "maybe," or "don't know" when asked if they would continue work in nursing after retirement. This suggests that commitment to the retention of older nurses in the workforce should continue to receive attention from nursing executives. The group that responded with a definitive "yes" (16%) for working as a nurse after official retirement favored a paid part-time position. Receiving recognition and respect, receiving ongoing

feedback on performance, having a "voice," increased compensation, and more vacation time were all identified as important to the retention of these older nurses (Palumbo et al., 2009).

Another perspective on retention of older nurses was also found in the literature. Utilizing nurses willing to serve as volunteers after retirement has been found mutually beneficial to those volunteering as well as to less experienced nurses (Cocca-Bates & Neal-Boylan, 2011; Neal-Boylan et al., 2009). Serving in a volunteer role allows for continued mental engagement and recognition of experience that supports the mentoring of younger nurses (Cocca-Bates & Neal-Boylan, 2011).

Decreased odds of leaving the nursing profession have been seen with work environment characteristics reflective of adequate staffing and resources, nursing's positive impact on organizational affairs, good nurse-physician relationships, and schedule flexibility (Leineweber et al., 2016). Collaboration between health care providers and leadership support has been found to significantly impact job satisfaction, intent to leave, and quality of care (Ma, Shang, & Bott, 2015). Organizational climate and a tight labor market also impact intent to leave (Stone et al., 2007). Most recently, Holland et al. (2019) studied survey responses from 2,984 nursing professionals and determined that perceived workload, although associated with intention to leave the occupation, can be mediated through effective organizational support. Flinkman et al. (2008) found that nurses considering leaving the profession reported personal burnout, doubted opportunities for career development, had low personal commitment, and often reported conflicts between job and family. Skillman et al. (2010) identified that the most influential characteristics of non-retired RNs who allowed their nursing license to expire

included disability/illness, the stress of nursing, and family commitment. Greater age, higher degree levels, and increased organizational tenure have been associated with higher job satisfaction and intent to stay in a current nursing position. Comparatively, younger cohorts of nurses report experiencing disillusionment in the nursing role, which manifests as intent to leave (Chan et al., 2008; Klaus et al., 2012). Although the intent to leave a job versus intent to leave the profession may be viewed as different operationally, the overall experience of dissatisfaction in a nursing role remains a concern to be addressed by the nursing profession.

A single study conducted in Iowa found that the majority of nurses not renewing their nursing license (83.6%) reported retirement as the reason (Russell et al., 2008). Home responsibilities and career change were the next two most frequent reasons cited (Russell et al., 2008). Personal characteristics such as male gender (Borkowski et al., 2007; Leineweber et al., 2016), White-non-Hispanic ethnicity (Borkowski et al., 2007), and education level less than a master's degree (Borkowski et al., 2007) are additional variables associated with a higher intent to leave the nursing profession.

One area where more longitudinal research could contribute significantly would be to determine if the intent to leave the nursing profession translates into actual leaving. Nooney et al. (2010) reported that the lack of more detailed longitudinal data on the nursing workforce in the U.S. inhibits the ability to follow attrition and "nurse retirement is particularly understudied" (p. 1876). These researchers found that leaving the nursing workforce accelerates for nurses over age 61 (suggesting retirement); another clear contributing factor to actually leaving is family responsibilities. In contrast to other

studies, they also found that nurses holding BSN or higher degrees are more likely to leave the profession.

In 2017, AL-HAC reported Alabama RN intent to leave the workforce within the next 10 years due to retirement was approximately 27% (AL-HAC, 2017). Intent to leave for Alabama's acute care RN workforce is unknown and thus is new knowledge contributed by the current study.

The Impact of Recruitment and Retention on Supply

Prior sections of this literature review demonstrated a consensus that the supply of RNs is dependent upon the continuation of successful recruitment of younger entrants to the profession along with greater attention to retention of the current workforce. It is generally accepted that a more stable nursing workforce would result from this strategy. Literature also addresses necessary considerations when planning retention strategies for older nurses. This section reviews research that considered the additional concept of turnover as it relates to recruitment and retention and, which adds further evidence to consider.

The nursing turnover rate in the U.S. has been estimated at 20% (LeVasseur et al., 2009). However, other studies have found 17% to 26% of new RNs leave their first job within two years (Kovner, Brewer, Fatehi, & Jun, 2014; Kovner & Djukic, 2009). Kovner, Brewer, Fatehi, and Katigbak (2014) compared two new RN cohorts graduating six years apart. They found that fewer nurses in the later cohort (2011 graduates) worked in hospitals, a more significant percentage held positions in which direct care was not provided, and a higher percentage held part-time positions. Using national-level data, Yoo et al. (2016) found that new RNs with prior health-related employment experience

were more likely to work full-time and work longer hours than new RNs without prior experience.

Work environment consistently appears in the literature as impacting RN retention and turnover. Unstable work schedules and high stress contribute to lower job satisfaction, lower job cohesion, and higher turnover (Shader et al., 2001). Factors contributing to a poor work environment are identified as inadequate staffing (Gardner et al., 2007); poor physical facilities (specifically unit size and safety concerns); leadership/managerial/organizational factors; workplace stress; workplace location (rural versus urban); and personal factors such as age, family, values, and salary (Currie & Carr Hill, 2012). Brewer et al. (2015) used structural equation modeling to determine that job satisfaction and organizational commitment act through intent to leave/stay to predict turnover.

In summary, the literature review identified several factors that must be considered when studying RN workforce supply. Health care stakeholders in Alabama will benefit from a study which explores not only the size of the RN acute care workforce, but also important factors such as education level, changing demographics, intent to leave the workforce, and vacancy data in the state. This knowledge is foundational to future workforce planning.

Registered Nurse Workforce Demand

Buerhaus (2010) aptly summarized the nature of nurse workforce demand: "The number of nurses employed at any given time is determined by healthcare organizations' demand for nursing services…to satisfy society's demand for health care" (p. 87). New roles for managing teams and new models of care delivery driven by new payment

models will continue to affect demand (Auerbach et al., 2013). Nevertheless, library database searches revealed a paucity of literature addressing the measurement of current nursing workforce demand. The National Forum of State Nursing Workforce Centers website (https://nursingworkforcecenters.org/) reports that 20 states collect nurse demand data; however, very few publications reporting this demand data were found. Comparatively, state RN workforce supply publications are plentiful through workforce center websites. Examples of nursing workforce demand reports that were found to contribute essential variables to measure in this study are detailed below.

The Florida Center for Nursing publishes biennial employer demand survey reports with trend analysis on their website (https://www.flcenterfornursing.org/). Their employer survey gathers information from six industry groups. The 2011 employer survey had a 46.1% response rate from hospitals (Florida Center for Nursing, 2012). Large and medium-size hospitals had a higher survey return rate than small hospitals. Based on the survey responses, it was found that 81% of the Florida hospital nurse workforce are RNs, and 8.8% of all employees are temporary. Separation from employment was highest in hospitals and the highest among RNs. Turnover rates decreased during the recent recession, but RN vacancy rates were highest for direct care RNs. The most difficult positions to fill reported by the hospitals were those that required more experience or education. Based on the findings of the employer survey, the Florida Center for Nursing was able to make key recommendations to support nursing workforce planning and sustainability. The 2013 employer survey results again found that RN turnover was highest among direct care RNs and the most significant number of separations occurred with RNs (Florida Center for Nursing, 2014). According to this

survey, 71% of hospitals reported preferential hiring of new graduate BSN-prepared nurses. The 2015 survey showed a high turnover rate among RNs providing indirect care, such as those filling administrative or quality improvement/risk management-type roles, when the sample mean was considered (Florida Center for Nursing, 2016). However, the sample median did not reflect this, which demonstrated that the data were skewed from a facility level. The survey continued to find that the difficult-to-fill positions remained those that required experience or advanced education. The hospital pattern of preferential hiring of new graduate BSN nurses continued.

California has been collecting nurse demand survey data from general acute care hospital employers for several years. The 2014 employer survey report (Bates et al., 2015) found variations in demand for RNs across the state. Seventy percent of general acute care hospital employers showed a preference for hiring experienced nurses over new graduates, with BSN-prepared nurses preferred. However, few hospitals are requiring a BSN degree for employment. Sixty-eight percent reported a perception that demand was greater than supply, with 18% reporting a perception of high demand. Twenty percent of respondents reported that RN supply was higher than demand. Forty-three percent of the hospitals reported the creation of new RN job classifications during the prior year, and almost half of the respondents reported an expectation that employment needs for RNs would increase over the next year.

California's 2015 employer survey report (Bates et al., 2016) found that 40% of hospitals reported a perception of high demand for RNs, while only 5% reported that demand was greater than supply. Employers expressed a strong preference for experienced RNs and an increase in the use of temporary or travel RNs. Eighty percent of

the hospitals reported a preference for hiring BSN-prepared nurses, but there was no increase in the percentage of those that required the BSN degree for employment. Sixty-five percent of the hospitals reported an expectation that RN employment opportunities would increase over the next year due to persistent high vacancy rates, RN retirements, and expansion of services.

California's 2017 employer survey report (Chu et al., 2018) continued to identify that demand for RNs was still higher than the supply, with growing evidence that this perception was primarily based upon difficulty hiring nurses with experience. A shift in hiring patterns reflected hospital decisions to hire slightly more new graduate RNs while decreasing the use of temporary and travel RNs. The number of hospitals that reported a hiring preference for BSN-prepared nurses dropped to 54.9%, and concerns about impending RN retirements along with difficulty offering competitive salaries to attract experienced RNs was evident. Forty-three percent of the hospitals reported an expectation of an increase in RN employment opportunities over the next year due to vacancy rates, retirements, expansion of services, and the desire to hire permanent employees rather than temporary or travel RNs.

Alabama hospitals currently provide limited information that can be used to characterize nursing demand. What information can be found is available only in aggregate form from the Alabama Hospital Association, which gathers vacancy rates from its member hospitals (L. Gibson, personal communication, November 14, 2018). Prior to 2013, the American Hospital Association conducted a periodic Nursing Personnel Survey (NPS) (Grumbach et al., 2001), which asked more detailed questions than the American Hospital Association annual survey currently in use. Anecdotal reports

about shortages in nurse staffing suggest that currently the demand is higher than the supply. Since there is no gold standard used to define a nursing shortage, shortages self-reported by hospital administrators have been recognized as having face validity as a nursing shortage indicator (Grumbach et al., 2001).

Concurrently, and potentially consequently, high rates of temporary or travel nurse employment are believed to be occurring in Alabama; but there are no discoverable data to confirm or refute this belief. There is a small body of literature related to meeting hospital nursing workforce needs with contract nurses. One study found no relationship between the use of travel nurses and the quality of care (Faller et al., 2017) or patient mortality (Aiken et al., 2013). Xue et al. (2012) found that supplemental nurses are not less qualified than permanent nurses and demonstrate greater diversity. Vacancy rates, use of temporary nurses, anticipated separations, planned additions of new positions, and organization constraints can all contribute to current agency demand as well as future supply and demand. The current study contributes knowledge about hospital employer demand in Alabama.

Forecasting Future Nursing Workforce Supply and Demand

Projections for future nursing workforce supply and demand are prone to uncertainty due to the multiple contributing and dynamic factors in health care delivery. Squires et al. (2017) performed a scoping review identifying that nursing workforce forecasting methods vary significantly across studies and recommended that the development of nursing-specific models should receive further attention. These researchers concluded that forecasting models might be best informed at the individual

organizational level because nurse managers understand local contextual influences (Squires et al., 2017).

Another consideration surrounding the use and development of nursing supply and demand models is the knowledge that lack of accurate and reliable nursing workforce data leads to lower quality research (Storey et al., 2007). Data sources limit accuracy in a predictive capacity. For example, as stated earlier in this literature review, HRSA has predicted that between 2012 and 2025 there will be an annual increase in demand for RNs of 1.5% (HRSA, 2014) and that Alabama will have a surplus of RNs in 2030 beyond the predicted demand of 79,800 RNs (HRSA, 2017). Of note is that those HRSA demand projections are based upon population numbers and not reports directly from employers of nurses. Grumbach et al. (2001) found that the variable *nurses per capita* had a weak correlation with hospital self-reports of shortages and vacancy rates. Contradictory to the belief that "nursing markets are local" (Auerbach et al., 2017a, p. 116) is the reality that workforce analyses of regional distributions of nurses with market-level data are sparse (Brewer, 2005). Terry's (2008) review of different approaches used to model nursing demand suggested that all models demonstrate significant flaws, and a valid model requires geographic localization at a county level. She recommended that reliable models must include: a) standardized definitions, b) effect of nurse compensation, c) price of nursing services, d) all educational levels of nurse providers, e) real changes in population demographics, f) only primary data generated by the researcher, g) avoidance of using number estimates, h) robust longitudinal data, i) strict limits on assumptions, and j) avoidance of presenting multi-leveled data. For this literature review, examples of modeling approaches that have been used are summarized below.

Simulations using publicly available data have contributed to forecasting efforts (Murphy et al., 2016; Murphy et al., 2009). For instance, a stock and flow approach with adjustment for workforce participation has been used to conceptualize the nursing workforce supply (Spetz, 2017). Supply simulations have modeled the impact of increasing numbers of students in education programs (Murphy et al., 2009; Spetz & Given, 2003), increasing wages (Spetz & Given, 2003), improving retention of existing RNs (by decreasing workforce exit rates) (Murphy et al., 2009; O'Brien-Pallas et al., 2004), improving RN productivity (through better working conditions and practices) (Murphy et al., 2009), and improving population health (Murphy et al., 2009). Simulations for population health changes have included scenarios in which population health improved, stayed the same, or declined. These simulations have been used to highlight the potential importance of health promotion activities to impact population health. These researchers also modeled workforce demand using simulations incorporating a needs-based approach. This approach estimated the number of RN services required by the population with advancing age and decreasing levels of health categorized through self-assessment (Murphy et al., 2009).

Juraschek et al. (2012) reported a different approach to forecasting nursing supply and demand. Inputs to their demand model included state-projected personal health expenditures, population ages, and population sizes. The baseline for their model was the 2009 national RN per 100,000 population ratio. An acknowledged limitation of the model was the starting-point assumption that this ratio was reflective of meeting demand. The supply model was based upon inputs from the Current Population Survey (CPS) with the assumption that the current levels of RN utilization, the number of RNs being produced

from educational programs, and the propensity for entry to the nursing profession would remain the same. The researchers acknowledge several limitations of the model. First, the projections were represented as the number of jobs instead of FTEs, so separate contributions of full-time and part-time nurses are not captured. Second, there was an assumption that the propensity to enter the profession was the same across all states. Third, other factors known to influence supply and demand, such as wages, immigration policies, and technology development, were not part of the models.

Peter Buerhaus, David Auerbach, and Douglas Staiger form a group of researchers recognized as leading forecasters in the U.S. Their nursing supply model (the Cohort Supply Model) considers the effects of cohorts and age effects. A cohort effect is defined as "the propensity of individuals born in any given year to work as an RN" (Auerbach et al., 2017, p. 284). Age effect is defined as "the propensity of RNs to be working at different ages over their career lifespan" (p. 284). Many of the factors that can affect supply, such as alternative career opportunities, are considered implicit in their model. The model has been developed over many years and benefits from the long history of repeated observations. National survey data are used to provide model inputs. Analysis of variance is the statistical technique used to estimate age and cohort effects, with the dependent variable being FTE RNs. Until 2016, their model assigned 1.0 FTE to individual nurses who reported working more than 30 hours, while those working fewer than 30 hours were assigned 0.5 FTE.

Another group recognized as leading forecasters in the U.S. is HRSA. In collaboration with IHS Markit (https://ihs.com) (Auerbach et al., 2017), HRSA developed a microsimulation model, which attempts to model individual decisions by nurses in the

workforce rather than by cohort (Chattopadhyay et al., 2016). Annual projections of RN supply are made by adding estimated national numbers of newly licensed RNs (based upon NCLEX-RN pass rates) and subtracting an estimated number of workforce separations. This then serves as the new starting value for the following year. Workforce participation rates are predicted using regression equations, and national data sources provide information on other factors such as age survival probabilities and labor market characteristics like wages and unemployment (HRSA, 2015).

In 2016, the Buerhaus team and HRSA team of forecasters met to work together to improve nursing workforce forecasts (Auerbach et al., 2017). One of the key differences found between models was the way FTE was defined. As a result of the meeting, both groups decided to define 1.0 FTE as a 40-hour work week for future modeling. The most significant variance between these two models, however, was how new entrants were modeled. As stated above, HRSA determines new entrants to the workforce through the successful completion of the licensure exam. Comparatively, the Cohort Supply Model uses the average size of recent cohorts to estimate future workforce entry. It is essential to consider this difference in model input when comparing and interpreting model findings. Both groups acknowledged there are additional factors that impact nursing workforce numbers and emphasized the importance of using state-level data when attempts are made to forecast or model state-level workforce numbers.

Dr. Joanne Spetz has been participating in RN workforce forecasting for the state of California for several years. California's supply model factors include the following:

- the stock of current licensed RNs
- graduates from California nursing programs

- graduates from other states who obtain their first license in California
- international immigration of nurses
- age distributions of new graduates
- interstate migration of RNs to California
- movements from inactive to active licensure
- movements from lapsed to active license status
- migration of nurses out of California
- movement from active to inactive or lapsed license (Spetz, 2017)

The California demand model considers multiple different forecasts that are then combined to provide a report based upon ranges of forecasted values. Forecasts that contribute include:

- forecasts based on RNs per capita
- forecasts based on hospital staffing of RNs per patient day
- Employment Development Department forecasts
- HRSA Bureau of Health Workforce forecasts (Spetz, 2017)

In summary, there are a variety of nursing workforce supply and demand forecasting models used in the U.S. This literature review summarized the models used by leading researchers recognized for their expertise on national and state levels. The present research utilized data that were collected or otherwise available to the researcher in order to simulate a relatively short time frame of future supply and demand numbers, given the lack of state-level longitudinal data sources available.

Conceptual Framework

The conceptual framework used in this study was developed by the researcher (see Figure 2) and is informed by the literature synthesized in this integrative review. Supply and demand of the acute care RN workforce are presented in a format that acknowledges their interconnectedness, and the complexity of factors affecting the concepts is recognized. An overwhelming majority of the research literature published on the supply and demand of the nursing workforce (over 90%) did not overtly specify a conceptual model. During the review of the literature, four distinctly different conceptual models related to nursing workforce supply and/or demand were identified. However, each model was vastly different, and no one model was identified as a conceptual fit with this study. The supply side of the model, however, does demonstrate congruence with prior work based upon a general approach to supply as a stock and flow concept.

Compensation

Compensation is depicted as an influencing agent to supply and demand, as stated by the economic laws of supply and demand. Compensation includes wages and/or benefits paid to the acute care nurse. Data to better understand this factor were retrieved from publicly available Alabama Department of Labor data. These data were then used to investigate the potential impact of compensation on the supply and demand balance of the model.

Current Supply and Demand

Alabama's current acute care hospital RN FTE supply was determined through RN self-report of primary employment in the hospital setting along with their determination of part-time or full-time status based upon the number of hours worked in a

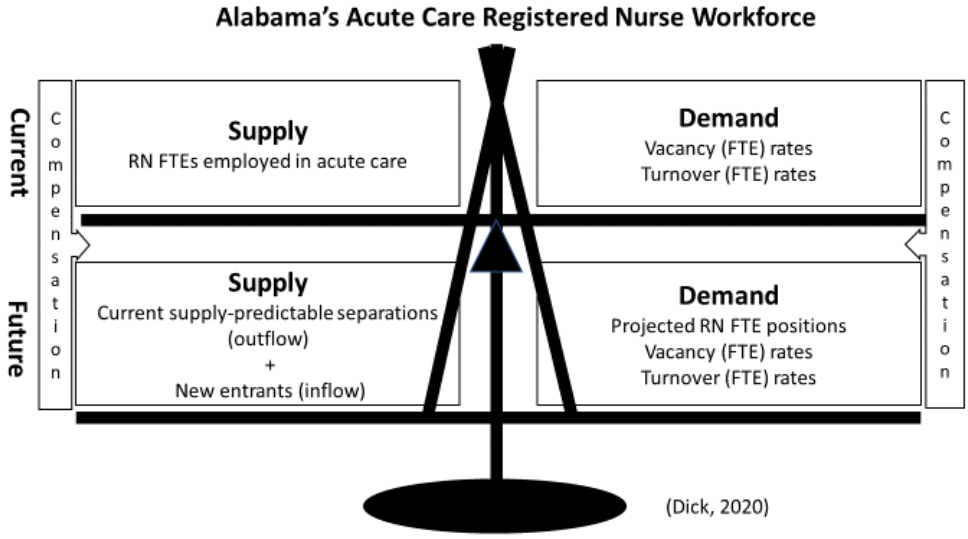
typical week. The RN workforce supply was also characterized by demographics (age, gender, race, and ethnicity) and education level. Current demand was characterized by identifying FTE vacancy rates and turnover rates reported at the time of employer demand survey completion. Together, the current supply and demand represent a baseline that reflects whether equilibrium in the acute care nursing workforce labor market is present. If there is evidence of an acute care nursing shortage or surplus, it will be concluded that there is an imbalance between current supply and demand. Understanding the state of current supply and demand is foundational to securing a future supply and demand equilibrium.

Future Supply and Demand

Alabama's future acute care workforce supply will be represented by a stock and flow (Spetz, 2018) approach based on current supply numbers minus predictable separations plus new entrants. New entrants are those entering the workforce by examination or endorsement. Planned retirements reported as part of the supply survey secondary data analysis will serve as a proxy for predictable workforce separations. Future demand will be determined with the quantification of projected RN FTE positions, FTE vacancy rates, and turnover rates. Although the concepts of future supply and demand are less concrete than current evidence will supply, the model represents a state of equilibrium as a desirable outcome.

Figure 2

Supply and Demand for Alabama's Acute Care Registered Nurse Workforce



Summary

Ongoing research delineating RN workforce supply and demand is vital to the delivery of quality health care services. History has documented how nursing shortages negatively impacted the delivery of hospital services. Today there is an increase in our aging population, more people live with chronic disease, and there is an expectation of an increase in nursing workforce retirements. The literature suggests that the demand for acute care RNs will continue to rise. At this time, what is known about the acute care workforce supply and demand in the state of Alabama is insufficient. This chapter has provided a review of the literature addressing nursing workforce supply and demand, along with concepts and/or factors shown to be interrelated. Gaps in knowledge at the state level have been identified and support the need for this research. The knowledge

generated from this study can be used to guide recommendations on strategies to mitigate imbalances between acute care RN supply and demand with the ultimate goal to prevent adverse health outcomes among Alabamians.

The following chapter details the study methods, including sampling considerations, participant consent, data collection procedures, and strategies implemented to support research rigor and credibility of findings.

CHAPTER 3

METHODOLOGY

Study Design

This study was conducted in order to characterize supply and demand of Alabama's acute care registered nurse (RN) workforce. An exploratory, descriptive design was used for this study based on cross-sectional data. An exploratory, descriptive design is useful to describe and document a situation (Polit & Beck, 2017) or population (Brink & Wood, 1998b). Descriptive studies have a limitation in that they utilize non-probability sampling and are therefore unable to show causation. However, a descriptive design was most appropriate for this study due to the need for foundational knowledge regarding the supply and demand of Alabama's acute care RN workforce. The purpose of this chapter is to detail the research methods that were used to conduct the study. Each of the study's four aims is addressed separately. Sampling, protection of human subjects, data collection procedures, data collection instruments, and the methods used for data analysis are presented.

Methods

The study had four aims. Aim 1 consisted of a secondary data analysis used to describe Alabama's current acute care RN workforce supply. Aim 2 of the study instituted primary data collection utilizing a modified Dillman survey methodology to investigate acute care RN workforce demand from the employer perspective. Aims 3 and

4 used data collected for Aims 1 and 2 to frame an outlook on the future supply of and demand for acute care RNs in Alabama.

Aim 1: Acute Care Registered Nurse Current Supply

Study Aim 1 was to characterize the current supply of acute care RNs in Alabama. The research questions were:

RQ 1: How many RNs were licensed and employed in Alabama's acute care hospitals in 2016? in 2018?

RQ 2: What were the demographics (age, ethnicity, race, gender) of RNs licensed and employed in Alabama's acute care hospitals in 2016? in 2018?

Sample

Aim 1 used a convenience sample of records from acute care RNs who completed a voluntary survey during the Alabama Board of Nursing (ABN) registered nurse license renewal in 2016 or 2018. The survey questions were based upon the National Forum of State Nursing Workforce Center's Minimum Nurse Supply Dataset (MDS, 2016). Survey participant answers were filtered to meet current study inclusion and exclusion criteria. The inclusion criteria for this study were: a) active Alabama RN licensure, b) active employment in nursing, c) primary employment in Alabama, and d) primary nursing practice in a hospital setting. The only exclusion criterion was RNs practicing in an advanced practice role. Therefore, RNs who reported holding credentials in Alabama to practice as a certified nurse practitioner, clinical nurse specialist, certified registered nurse anesthetist, or certified nurse-midwife were excluded from the study sample.

Protection of Human Subjects

Informed Consent

The survey recruitment strategy used by the ABN was an invitation to participate during the online license renewal process. The following message was included at the beginning of the electronic survey opportunity:

> The Alabama Board of Nursing is asking you to voluntarily provide information about your employment and educational preparation. No individual data will be reported; your responses will be combined and analyzed with those of other nurses. Your answers are critical to planning for future nurse workforce needs in the state, as well as essential to project future needs of nurses. Thank you. (ABN, 2018, "My Workforce Survey")

ABN personnel retained the ability to identify individual respondent answers since the voluntary survey was delivered after entry into the online license renewal system. For the current research study, all data were de-identified by ABN personnel prior to sharing the survey data with the researcher. Thus, survey respondent anonymity for this study was assured.

Institutional Review Board

The researcher received study approval through the Institutional Review Board (IRB) at The University of Alabama at Birmingham (UAB) (see Appendix B). The study protocol was approved as an exempt review. Once IRB approval was obtained from UAB, an ABN Institutional Review Committee process was followed. ABN research authorization requirements included: a) submission of a confidentiality and conflict of interest agreement, b) submission of a data use agreement, and c) an official research

proposal (see Appendix B). All data were stored in an encrypted format and transferred to the researcher by the ABN per the data sharing agreement.

Data Collection

Primary collection of the data occurred by the ABN during two license renewal periods. The first collection period occurred between September 1, 2016, and December 31, 2016. The second collection period occurred between September 1, 2018, and December 31, 2018. The survey was administered in an electronic format during both time frames. Although embedded in the license renewal process, the survey was introduced within the process, allowing autonomy of participation. Mandated regulatory questions were also a part of the license renewal process. In 2016, the voluntary survey questions were delivered after the mandated regulatory questions. In 2018, the voluntary survey questions were delivered prior to the mandated regulatory questions. Additionally, the ABN used social media in 2018 to promote participation in the voluntary survey prior to and during the licensure renewal period. There was a larger survey participation rate (82%) during the 2018 renewal period compared to the 2016 renewal period (49%).

Survey

The Nurse Supply MDS was originally constructed to guide collection of state-level data and resulted from consensus-building work that occurred in 2009. It is recognized as having content validity (Moulton et al., 2012; Nooney et al., 2010). The State Forum of Nursing Workforce Centers Research Committee periodically reviews the MDS, to make sure the survey questions are still relevant (Smiley et al., 2018). An overview of this consensus-building process (Moulton et al., 2012; Nooney et al., 2010) is presented here.

In June 2008, a total of 31 states were invited to participate in the project. This included 28 states that were already collecting supply, demand, and/or educational program data and agreed to share their data collection instruments. Alabama was one of the states that participated in the process without having established data collection instruments to share. All survey items from individual state survey data collection instruments were compiled into a spreadsheet, and each variable was ranked for importance by members of the group. Workgroups were then established to identify which concepts and methods of measurement should be part of a minimum data set. A data summit was held where all workgroups presented their recommendations to the entire group of participating state representatives. Public comments were solicited, and national nursing organizations were contacted to participate in commenting. Specific experts were asked to review the MDS. The National Forum of State Nursing Workforce Centers reported that 10 national entities responded to the call for comments, and they also received input from experts who were working on the Health Resources and Services Administration's (HRSA's) nurse supply and demand model. According to Moulton et al. (2012), national entities that responded included (p. 167):

- American Organization of Nurse Executives (renamed American Organization for Nursing Leadership in 2019)
- Interagency Collaborative on Nursing Statistics
- Center to Champion Nursing in America
- Southern Regional Education Board
- American Association of Nurse Anesthetists
- Association of State and Territorial Directors of Nursing (Public Health)

- American Association of Colleges of Nursing
- National League for Nursing
- National Council of State Boards of Nursing
- Southeast Region for Health Workforce Studies

The recommended survey items were ratified by the National Forum of State Nursing Workforce Centers in 2009.

The content of the MDS was reviewed by the National Forum of State Nursing Workforce Centers Research Committee throughout 2015 to reassess content validity due to the changing health care environment and changes in the roles that nurses play in health care delivery. Members of the research committee, executive directors of all forum members, national organizations, and health care workforce researchers reviewed the suggested updates to the MDS and provided feedback as necessary. An updated MDS was ratified by the National Forum of State Nursing Workforce Centers in 2016 (Smiley et al., 2018). The MDS recommended items are detailed in Table 2.

Today, the MDS has also been used to conduct a biennial national-level survey that began in 2013 through a collaborative agreement between the National Council of State Boards of Nursing and the National Forum of State Nursing Workforce Centers (Budden et al., 2013). The two joined forces to conduct a National Nursing Workforce Survey during a time when the U.S. government's HRSA ceased conducting their National Sample Survey of Registered Nurses (https://www.census.gov/nssrn). Subsequent collaborative national-level surveys utilizing the MDS items have taken place successfully in 2015 and 2017 (Budden et al., 2016; Smiley et al., 2018). The national-level surveys used random samples stratified by state (Smiley et al., 2018).

Table 2

Nurse Supply Minimum Data Set Elements

Item #/ Variable	Stem (Example)	Response Categories
1. Gender*	What is your gender?	Male Female
2. Ethnicity*	Are you of Hispanic or Latino origin?	Yes No
3. Race*	What is your race? (Mark all that apply)	American Indian or Alaska Native Asian Black/African American Native Hawaiian or Other Pacific Islander White/Caucasian Other
4. Year of birth	In what year were you born?	Open field
5. Entry level education	What type of nursing degree/credential qualified you for your first U.S. nursing license?	Vocational/Practical Certificate-nursing Diploma-nursing Associate degree-nursing Baccalaureate degree-nursing Master's degree-nursing Doctoral degree-nursing (PhD) Doctoral degree-nursing (DNP)
6. Highest level of nursing education	What is your highest level of nursing education?	Vocational/Practical Certificate-Nursing Diploma-Nursing Associate degree-Nursing Baccalaureate degree-Nursing Master's degree-Nursing Doctoral degree-Nursing (PhD) Doctoral degree-Nursing Practice (DNP) Doctoral degree-Nursing other
7. Highest level of education in another field	What is your highest level of non-nursing education?	Associate degree-Non-nursing Baccalaureate degree-Non-nursing Master's degree-Non-nursing Doctoral degree-Non-nursing Not applicable
8. License type	What type of license do you currently hold? (Mark all that apply)	RN LPN APRN

9. Year of Initial U.S. Licensure	Year of Initial U.S. licensure	Open-ended field or drop-down menu
10. Country of Initial RN/LPN licensure	In what country were you initially licensed as RN or LPN?	Open-ended field
11. License status*	What is the status of the license currently held?	Active Inactive
12. Advanced Practice Registered Nurse License/Certification*	Indicate whether you are credentialed in your state to practice as any of the following: (Select all that apply)	Certified Nurse Practitioner Clinical Nurse Specialist Certified Registered Nurse Anesthetist Certified Nurse Midwife Not credentialed as any of the above
13. Employment status*	What is your employment status? (Mark all that apply)	Actively employed in nursing or in a position that requires a nurse license full-time Actively employed in nursing or position that requires a nurse license part-time Actively employed in nursing or in a position that requires a nurse license on a per-diem basis Actively employed in a field other than nursing full-time Actively employed in a field other than nursing part-time Actively employed in a field other than nursing on a per-diem basis Working in nursing only as a volunteer Unemployed, seeking work as a nurse Unemployed, not seeking work as a nurse Retired
14. Reason for being unemployed	If unemployed, please indicate the reasons.	Taking care of home and family Disabled Inadequate salary School Difficulty in finding a nursing position Other
15. Number of positions employed in*	In how many positions are you currently employed as a nurse?	1 2 3 or more

16. Hours worked per week	How many hours do you work during a typical week in all your nursing positions?	Open-ended field
Item #/ Variable	Stem (Example)	Response Categories
17. Employer's address	Please indicate the state and zip code of your primary employer.	Open-ended field
18. Employment Setting* (recommend collection for both primary* and secondary settings)	Please identify the type of setting that most closely corresponds to your nursing position.	Hospital Nursing Home/Extended Care Assisted Living Facility Home Health Hospice Correctional Facility School of Nursing Public Health Dialysis Center Community Health School Health Service Occupational Health Ambulatory Care Setting Insurance Claims/Benefits Policy/Planning/Regulatory/Licensing Agency Other
19. Employment Position (recommend collection for both primary and secondary positions)	Please identify the position title that most closely corresponds to your nursing practice position.	Consultant Nurse Researcher Nurse Executive Nurse Manager Nurse Faculty/Educator Advanced Practice Registered Nurse Staff Nurse Case Manager Other-Health Related (please specify) Other-Not Health Related (please specify)
20. Employment Specialty (recommend collection for both primary and secondary specialties)	Please identify the employment specialty that most closely corresponds to your nursing practice position.	Acute Care/Critical Care Adult Health Family Health Anesthesia Cardiology Community Geriatric/Gerontology Home Health Maternal-Child Health/Obstetrics Medical Surgical Nephrology Occupational Health

	Oncology Palliative Care/Hospice Pediatrics Neonatal Perioperative Public Health Psychiatric/Mental Health/Substance Abuse Rehabilitation School Health Emergency/Trauma Women's Health Other-Clinical specialties (please specify) Other-Non-clinical specialties (please specify)

Note. Items that contributed to the current study are designated with an asterisk*

Source: http://nursingworkforcecenters.org/wp-content/uploads/2016/11/National-Forum-Supply-Minimum-Dataset_September-2016.pdf

The Alabama survey contained all MDS elements. Slight modifications in the technical delivery format for responses are summarized in Table 3. The ABN also included three additional items in Alabama's survey to gather information deemed important to the ABN. Those additional items are also summarized in Table 3.

Table 3

Modifications and Additions to Recommended MDS Elements in Alabama's Survey

Item #/ Variable	MDS	ABN MDS Survey
4. Year of Birth*	In what year were you born? Suggested response categories as open-ended field	What is your age? Drop-down categories for answer options: 15-19 years 20-24 years 25-29 years 30-34 years 35-39 years 40-44 years 45-49 years 50-54 years 55-59 years 60-64 years 65-69 years 70-74 years 75-79 years 80-84 years 85 years and older
6. Highest level of nursing education*	What is your highest level of nursing education? Response categories: Vocational/Practical Certificate-Nursing Diploma-Nursing Associate degree-Nursing Baccalaureate degree-Nursing Master's degree-Nursing Doctoral degree-Nursing (PhD) Doctoral degree-Nursing Practice (DNP) Doctoral degree-Nursing other	What is your highest level of nursing education? Response categories: In addition to those recommended in the MDS, Alabama's survey added the following options: Baccalaureate degree-other field Master's degree-other field
9. Year of Initial U.S. Licensure*	Year of initial U.S. licensure Suggested response categories as open-ended field or drop-down menu	Year of initial U.S. licensure Response categories supplied as drop-down menu categories: 2015-2018 2010-2014 2005-2009 2000-2004 1995-1999 1990-1994

		1985-1989 1980-1984 1975-1979 1970-1974 1965-1969 1960-1964 1955-1959 1950-1954 1936-1949
16. Hours worked per week*	How many hours do you work during a typical week in all your nursing positions? Suggested response categories as open-ended field	How many hours do you work during a typical week in all your nursing positions? Response categories supplied as drop-down menu categories: 1 hour-20 hours 21 hours-32 hours 33 hours-48 hours More than 48 hours
17. Employer's address*	Please indicate the state and zip code of your primary employer. Suggested response categories as open-ended field	Please indicate the state and zip code of your primary employer. Response for state designation was offered in a drop-down menu format. Response for zip code was left as open-ended field.
24. Telehealth	Not included as written	Do you utilize telehealth in your primary or secondary position? Response categories: Yes No
25. Telehealth	Not included as written	If yes, when utilizing tele-health, are patients ever located in a different state? Response categories: Yes No
26. Separation from nursing workforce*	Not included as written	When do you plan to retire from your primary nursing position or leaving [*sic*] the nursing workforce? Response categories: Within the next 5 years Within the next 10 years Within the next 15 years Within the next 20 years Greater than 20 years

Note. Items that contributed to the current study are designated with an asterisk*

After determining the inclusion and exclusion of appropriate survey response records, the current study extracted from the ABN MDS survey data set the responses for 14 of the total 26 survey items. These survey responses were used to characterize the supply of acute care RNs. Specific items that contributed to the secondary data analysis for the current study are designated with an asterisk (*) in Tables 2 and 3.

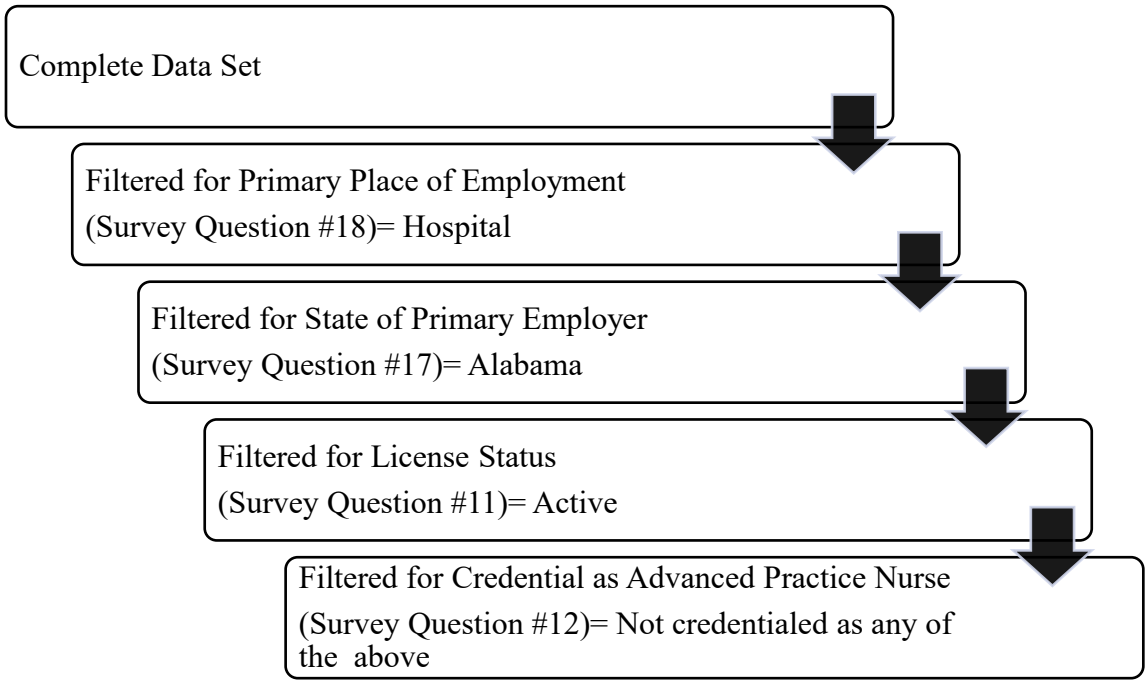
Data Analysis

The 2016 and 2018 Alabama survey data sets were analyzed separately. Each license renewal period survey reflected a cross-section of the nursing workforce at that specific time. The anticipated benefit of using two separate data sets to characterize supply was the ability to identify changes from one time to another and provide data that could contribute to trending, required for Aim 3. The following steps were taken for both the 2016 and 2018 survey data sets.

Personnel at the ABN reported to the researcher the total number of RNs who participated in license renewal at each period. The complete survey data set was provided to the researcher in a Microsoft Excel spreadsheet. The number of RNs representing acute care RNs for this study was determined by using Microsoft Excel to systematically filter the survey data set based upon the study inclusion and exclusion criteria (see Figure 3).

Figure 3

Application of Study Inclusion and Exclusion Criteria to 2016 and 2018 ABN Data Sets



Note. This figure demonstrates the steps taken to select the study sample used for acute care RN supply.

Once the inclusion and exclusion criteria were used to identify the study sample, the variables of interest in this study were copied to a new Microsoft Excel spreadsheet to create a study data set.

Data analysis was performed utilizing a combination of Microsoft Excel, IBM SPSS (Version 26) software, and open-source R statistical software (https://www.r-project.org/). Cleaning of the data occurred in Microsoft Excel. A code book was created that included each survey item contributing data to this study. In the code book, each variable was identified by name assigned to the variable, a label, level of measurement, how the variable was recorded in the raw data (numeric versus string), numerical codes assigned for categorical variables, and units of measurement for interval-ratio level

measurement variables. Nominal-level data were coded as a dummy variable (0,1). Ordinal-level data were coded, maintaining order (0,1,2,3…). Interval-ratio data were left as submitted without format change. Data were assessed for missingness through identification in the Microsoft Excel spreadsheet utilizing the built-in search function. Empty spreadsheet cells were filled with NA to facilitate upload to the R and SPSS environments. The researcher's decision to use multiple software computing environments was to provide opportunity for self-checks of proper data coding and analysis outputs. Data were assessed for obvious outliers throughout the analysis. Where defendable, data identified as an outlier (for example, a recording of hours worked per week as over 1,000) were recoded as data not available to prevent skewing. Data were analyzed as unweighted.

Study Aim 1 and its associated research questions were answered using descriptive statistics, including frequencies, valid percentages, and cross-tabulations. Full-time equivalents (FTEs) were calculated from the survey-reported data of number of hours worked in a typical week (survey question #16) if that information was supplied. If a respondent did not supply the number of hours worked but did identify employment status as either full-time or part-time employment (survey question #13), FTE was calculated based upon that information. Target population estimates were made through proportional extrapolation. Table 4 summarizes the operational definitions used for Aim 1.

In summary, study Aim 1 was to characterize the current supply of Alabama's acute care RN workforce. The research questions were answered using a secondary analysis of cross-sectional data. The data were initially collected as part of a voluntary

survey administered by the ABN. The data collection time frames were during license renewals, which occurred at two separate time periods. De-identified data were analyzed to provide a description of the current Alabama acute care RN supply.

Table 4

Current Supply Variables

Data Source	Variable	Operational Definition
Secondary Analysis of ABN MDS Survey 2016 & 2018	Current Supply	
	Sample Count	# RNs that completed survey and met study inclusion/exclusion criteria
	Population Count Estimate	(# RNs in sample/total # RNs that completed survey)*total # RNs who renewed license
	RN FTEs Sample	(# RNs employed full-time * 1.0) + (# RNs employed part-time*0.5)
	RN FTEs Population Estimate	Population Count Estimate*% of part-time and full-time FTEs found in sample count

Aim 2: Acute Care Registered Nurse Current Demand

Aim 2 was to characterize the current demand for acute care hospital RNs in Alabama. The research questions to be answered were:

RQ 1: What was the 2019 demand for RNs practicing in Alabama's acute care hospitals?

RQ 2: What was the 2019 number of RN full-time equivalents (FTEs) budgeted for in Alabama's acute care hospitals?

RQ 3: What was the number of budgeted RN FTEs unfilled in 2019?

RQ 4: In what areas (specialties, units) were Alabama's greatest acute care hospital RN staffing needs in 2019?

Sample

Aim 2 was met through primary data collection from acute care RN employers in Alabama. The initial inclusion criterion was any health care organization in Alabama classified by the Centers for Medicare and Medicaid Services as an acute care facility in 2019 (https://data.medicare.gov/). Each facility contact person for this study was the individual in current active employment as the chief nursing officer (CNO) or director of nursing (DON). In addition to this original study inclusion criterion, nursing administrators at two Veterans Affairs (VA) Medical Centers in Alabama were also sent invitations to participate because VA facilities were not included with the Medicare.gov list. There are more than 375,000 veterans living in Alabama who may use the VA system for health care (https://va.alabama.gov/). Ninety health care organizations classified as acute care facilities in Alabama were registered with Medicare at the time of the study (https://data.medicare.gov/). However, one of the hospitals on the list was known to the researcher as recently closed, so that facility was deleted from the potential sample list. The addition of the VA Medical Centers brought the total target population at the beginning of the study to $N = 91$. During the study, one of the hospital facilities that was invited to participate was identified as closed, which left the actual target population at $N = 90$. A comprehensive list of the facility names along with their physical addresses

is provided in Appendix C. Before recruitment, it was determined that a sample size of 74 CNO/DON/hospital participants would provide a 95% confidence level with a 5% margin of error (https://www.qualtrics.com/blog/calculating-sample-size/). Several strategies to obtain an adequate response rate were implemented. Those strategies are detailed below.

Prior to the recruitment of CNOs/DONs for participation, the researcher communicated with several stakeholders to garner support for the research. Specifically, an individual affiliated with each of the following received a communication about the study: 1) Alabama Hospital Association, 2) Alabama Board of Nursing, 3) Alabama Organization of Nurse Executives officer, and 4) a board member of a large hospital system in Alabama. A brief study overview presentation was also completed on a local level at a monthly meeting of the Birmingham Regional Organization of Nurse Leaders.

Two individuals currently serving as CNOs and one individual previously employed as a CNO were asked to review the data collection tool, *Survey of Acute Care Registered Nurse Employers in Alabama 2019,* and provide content feedback. Simultaneous to these activities, information exchange occurred with other researchers, nurse leaders, and acute care facilities to compose a list of the names and contact information for CNOs/DONs which was subsequently used to disseminate the *Survey of Acute Care Registered Nurse Employers in Alabama 2019* after study IRB approval was obtained.

The CNOs/DONs invited to participate in the study were mailed a packet, which included a study introduction letter and a hard copy of the survey. Contents of the mailed packet are included in Appendix B. When there was an email address that was known for the potential CNO/DON respondent, an email invitation was sent later that same week

with a brief synopsis of the research study and a link to an electronic version of the survey. Both invitation formats (mailed packets and email invitations) provided information inviting the CNO/DON or a designee to complete the RN demand survey as a representative of their employing facility with the assurance that only aggregate data would be reported as an outcome of the study.

Protection of Human Subjects

Informed Consent

Completion of the survey indicated consent to participate and agreement with use of the data collected as was presented in the letter of introduction. The survey process allowed for free power of choice regarding study participation. Respondents could change their level of participation at any point through selective data entry or cessation of survey completion. All data collected were kept in a secure environment requiring password protection and restricted to access by the principal investigator only. Participants were informed that all data would be aggregated to region and state level during analysis. Regions for aggregation were adopted from the regional divisions used by AlabamaWorks!, which was established by the Alabama Workforce Council (https://alabamaworks.com/about/). Unique identifiers were assigned prior to survey dissemination to ensure confidentiality while allowing for aggregation to regions. The study respondent unique identifiers created for the current study were logged by the principal investigator, who kept the identifiers separate from the data in a secure environment. Only the principal investigator had access to the information, and it was not shared at any time with others. Therefore, participant risk was minimal. Participation in the study was neither directly nor indirectly implied to produce a positive impact on the

participant or the facility represented. However, one purpose of the research was to provide stakeholders, including survey participants, in Alabama with credible information about acute care RN demand. The time commitment for completion of the survey was estimated to be 20 minutes.

Institutional Review Board

The researcher gained study approval through the Institutional Review Board (IRB) at The University of Alabama at Birmingham (UAB) prior to contacting the potential survey participants (see Appendix B). An exempt review application was submitted as this research involved survey procedures included under exemption category 2.

Data Collection

Dillman's survey principles (Dillman et al., 2014) were used to ensure quality survey dissemination practices. The online Qualtrics survey tool was used to allow respondents the option of survey completion in a secure online format. The Qualtrics survey was delivered from within the UAB system technology environment, ensuring that safeguards were in place to provide for data encryption. Additionally, the Qualtrics product includes security measures that comply with policies outlined by the Federal Risk and Authorization Management Program (FedRAMP), which was established by the U.S. government for protecting sensitive data (https://www.qualtrics.com/platform/fedramp/).

Survey responders also had the option to complete the survey in paper format. A copy of the survey was delivered via U.S. Postal Service to all potential respondents. Each survey distributed was labeled with a number serving as a unique identifier. A pre-addressed and postage-paid envelope was included with the distribution of the paper-

based surveys to allow for the survey to be completed and returned without any expense or potential identification of any respondent. Mailing of the surveys to potential respondents occurred at two time periods during the full study. The first mailing occurred in July 2019 and represented the start point for data collection. All potential respondents were mailed a full research study packet ($N = 90$). No packets were returned to the researcher as undeliverable. An email invitation and link to the Qualtrics electronic survey option was sent later the same week to any potential respondents who had an email address either confirmed or shared with the researcher ($n = 63$).

Due to low survey response numbers, additional steps were taken to recruit respondents. An amendment to the IRB approval was obtained in August 2019 to allow phone calls to facilities that had received an earlier mailed research study packet (see Appendix B). There continued to be a low response rate, so an additional IRB amendment approval was secured to allow recruitment of respondents to occur by scheduled face-to-face meetings (see Appendix B). A complete timeline outlining the recruitment measures and attempts at data collection, which continued until April 2020, are summarized in Appendix C.

Survey

Acute care RN workforce demand was assessed utilizing a survey tool that combined questions found on other established employer demand surveys. The *Survey of Nurse Employers in California* survey instrument (https://rnworkforce.ucsf.edu/site/rnworkforce.ucsf.edu/files/2014EmployerSurvey.pdf) and the *Florida Center for Nursing's Hospital Nurse Employer* survey instrument (https://www.flcenterfornursing.org/DesktopModules/Bring2mind/DMX/Download.aspx

?Command=Core_Download&EntryId=1011&PortalId=0&TabId=151) served to guide the researcher in preparing a survey tool to be used in Alabama. Both original surveys are freely available for use by workforce researchers. However, due to the researcher's extensive use of questions that comprised the California survey instrument, permission to use the questions was obtained (see Appendix D). A combination of selected questions from both tools was determined to be beneficial for data collection in this inaugural Alabama research. The final *Survey of Acute Care Registered Nurse Employers in Alabama 2019* can be found in Appendix B.

The survey contained 38 items. General facility characteristics, RN employment statistics, and expectations of future RN hiring patterns were assessed. For this study, the current acute care RN demand was planned to be represented by respondent perception of labor market, reported vacancy (FTE) rate, and turnover (FTE) rate. The vacancy rate and turnover rate measurements are described in Table 5.

Table 5

Current Demand Variables

Data Source	Variable	Operational Definition
Survey of Acute Care Registered Nurse Employers 2019	Current Demand Vacancy (FTE) rate	(Total # of vacant FTEs/ Total vacant FTEs + total filled FTEs) x 100 (ICONS, 1993)
	Turnover rate	(# of RN separations during the last year/ average # RNs employed during the last year)*100 (Reinier et al., 2005) OR** (# RN separations during the last year/# FTEs budgeted)*100

Note. **Calculation used was based upon information that was supplied.

Data Analysis

Data analysis was performed utilizing Microsoft Excel, IBM SPSS, and open-source R statistical software (https://www.r-project.org/). Data received via the Qualtrics online survey option were exported to a Microsoft Excel spreadsheet to preserve a copy of the data collected in another secure location. Respondent answers from the online survey were also transferred manually to a hard copy of the survey, allowing for a second backup of all the employer survey data that had been received electronically. Reviewing the data multiple times permitted the researcher to identify missing data. Missing data were identified as missing, not at random. No data imputation procedures were performed. All survey responses, both those received as paper surveys and those received as Qualtrics electronic surveys, were manually entered into IBM SPSS. A code book was

automatically generated. Licensed bed size for each health care facility was added to the data set. This information was retrieved from the Alabama Hospital Association's hospital directory website resource page (https://www.alaha.org/resources/hospital-directory/). Aim 2 and its associated research questions were answered using descriptive statistics, including frequencies and percentages, calculations of FTEs budgeted, calculation of vacancy rates, and calculation of turnover rates.

In summary, the current demand for Alabama's acute care RN workforce was identified using a primary survey research method which obtained cross-sectional data collected from CNOs/DONs of acute care facilities in Alabama. Data collected were aggregated to predesignated region and state level. Descriptive statistics, perception of labor market conditions, vacancy rates, and turnover rates provided baseline information about current workforce demand.

Aim 3: Acute Care Registered Nurse Future Supply and Demand

Aim 3 was to estimate the future supply and demand for acute care hospital RNs in Alabama. The research questions included:

RQ 1: What is the estimated future supply of RNs licensed and employed in Alabama's acute care hospitals in 2 years (2020)? in 5 years (2023)?

RQ 2: What is the estimated future rate of retirement of RNs licensed and employed in Alabama's acute care hospitals in 5 years (2023)? in 10 years (2028)?

RQ 3: What is the estimated future demand for RNs licensed and employed in Alabama's acute care hospitals in 2 years (2020)? in 5 years (2023)?

Research questions for Aim 3 were answered utilizing data previously described for Aims 1 and 2. Table 6 provides a concise summary of future supply and demand variables that were informed by the data collection.

Data Analysis

Data analysis was performed utilizing open-source R statistical software (https://www.r-project.org/). Data were assessed for missingness initially through identification in the Qualtrics survey report. Data were reassessed for missingness after they were imported into the R environment. Decisions regarding statistical imputation procedures were made and carried out based upon the identified cause of missingness: missing completely at random, missing at random, or not missing at random. Descriptive statistics, including frequencies, percentages, means, medians, and standard deviation, were reported. Percentage of change between 2016 and 2018 supply data was calculated on variables of interest to identify trends. The variables of interest were nurse self-report for intent to retire or leave the nursing workforce as reported on Alabama's supply survey, average number of new entrants to the acute-care RN workforce annually, and future FTE hiring estimates. Intent to retire or leave the nursing workforce as reported by survey participants at both supply survey time points were used to extrapolate future supply numbers as impacted by this planned workforce attrition. The average number of new entrants to the RN acute care workforce annually was calculated based upon the percentages represented in the target population. Future FTE hiring estimates were derived from the employer demand survey.

In summary, study Aim 3 provided estimations of future supply and demand for acute care RNs in Alabama by using data collected through secondary data analysis and

primary survey research. Extrapolation of findings based upon supply trends and CNO specific reports of future RN workforce needs enabled these estimations.

Table 6

Future Supply and Future Demand Variables

Data Source	Variable	Operational Definition
Alabama Board of Nursing Annual Reports	Future Supply New entrants	Projection to fiscal year 2023 of # of new Alabama RN licenses issued by examination and endorsement annually based upon entrant numbers reported annually since fiscal year 2010
Secondary Analysis of ABN MDS Survey 2018	Separations	Projections to fiscal year 2028 of planned workforce separations based upon responses to Question #26: When do you plan to retire from your primary nursing position or leave the nursing workforce?
Survey of Acute Care Registered Nurse Employers in Alabama 2019	Future Demand Projected RN FTE positions	# of new FTE RNs projected to be added + current # FTE RNs budgeted for
	RN FTE Vacancy rates	VR = (Total number of vacant FTEs / Total vacant FTEs + total filled FTEs) x100 (ICONS, 1993)
	Turnover rates	TR = (Number of employees leaving /Average number of employees) x100 (Reinier et al., 2005)

Aim 4: Outlook

Aim 4 was to forecast whether future acute care hospital RN supply will meet future acute care hospital RN demand in Alabama. The research question to be addressed was:

RQ 1:Will Alabama's acute care RN workforce be sufficient to meet acute care workforce demand in Alabama in 2 years (2020)? in 5 years (2023)?

Data Analysis

This research question required further analysis of data obtained to answer Aims 1, 2, and 3. A nursing shortage was defined as FTE RN demand > FTE RN supply. A nursing surplus was defined as FTE RN demand < FTE RN supply. The employer demand survey also captured perceptions of CNOs/DONs at the acute care facilities to identify if there was a perceived shortage or surplus in the area. Best possible scenario and worst possible scenario simulations were planned to utilize the data collected and contributing public access data. For example, trending of Alabama data retrieved from ABN annual reports and Alabama Department of Labor RN labor statistics supplied supplementary public access data.

Reliability and Validity of the Proposed Study

The rigor and credibility of the findings generated by the study were addressed through appropriate data analysis. This study utilized two surveys that are not psychometric instruments. The consensus-building model used in the creation of the supply questionnaire items supports content validity. Content validity of the survey questionnaire to characterize RN demand was confirmed through review by three experienced CNOs prior to the dissemination of the survey. Test-retest reliability of the

survey instruments has not been established in prior studies and is considered a limitation of this study.

Summary

In summary, this study's exploratory, descriptive design required a combination of study methods. Alabama's acute care RN workforce current supply was determined through secondary analysis of data collected biennially by the ABN MDS survey. Alabama's acute care RN workforce current and future demand were determined through analysis of primary survey data collection from CNOs/DONs of Alabama acute care facilities. Data analysis provided descriptive statistics used to characterize Alabama's acute care RN workforce supply and demand. Data collected for Aim 1 and Aim 2 were both used along with other publicly available data sources in order to inform Aim 3 and Aim 4, which both addressed the future outlook for the acute care RN workforce in Alabama.

CHAPTER 4

RESULTS

Introduction

The purpose of this study was to address the gap in knowledge that exists about the supply and demand of acute care registered nurses (RNs) in the state of Alabama. The results of the study are reported in this chapter. The supply of acute care registered nurses was determined through a secondary analysis of voluntary survey data collected by the Alabama Board of Nursing (ABN) during biennial license renewal. This study utilized data collected during two license renewal periods, 2016 and 2018, to maximize what can be known about the characteristics of acute care RNs in Alabama. Descriptives of the 2016 and 2018 cross-sectional groups provide for comparison of the two groups. Next, target population estimates based upon extrapolation of the sample findings were conducted. These results provide an estimate of the number of licensed and employed acute care RN workforce members at the time of each license renewal, as well as the estimated number of full-time equivalents (FTEs) contributed. Additionally, data extracted from publicly available resources were analyzed to provide further contextualization for what can be known about the acute care registered nurse (RN) supply.

Demand for acute care RNs was evaluated using data collected in the *Survey of Acute Care Registered Nurse Employers in Alabama 2019*. Chief nursing officers (CNOs) and directors of nursing (DONs) completed the 38-item voluntary survey,

providing information on labor market perceptions, employment numbers, nurse recruitment, and organizational practices related to RN educational preparation. Survey results and supplemental calculations conducted to estimate vacancy rates and turnover, which provide additional insight into labor demand, are reported in this study. Concerns about the possibility of inaccurate data supplied were addressed through limited data substitution from the *American Hospital Association Annual Survey FY 2018*. This data source was made available to the researcher through the University of Alabama at Birmingham and made possible through a university agreement with Wharton Research Data Services. Specific data substitutions are detailed in the chapter section addressing workforce demand.

Sample

Supply

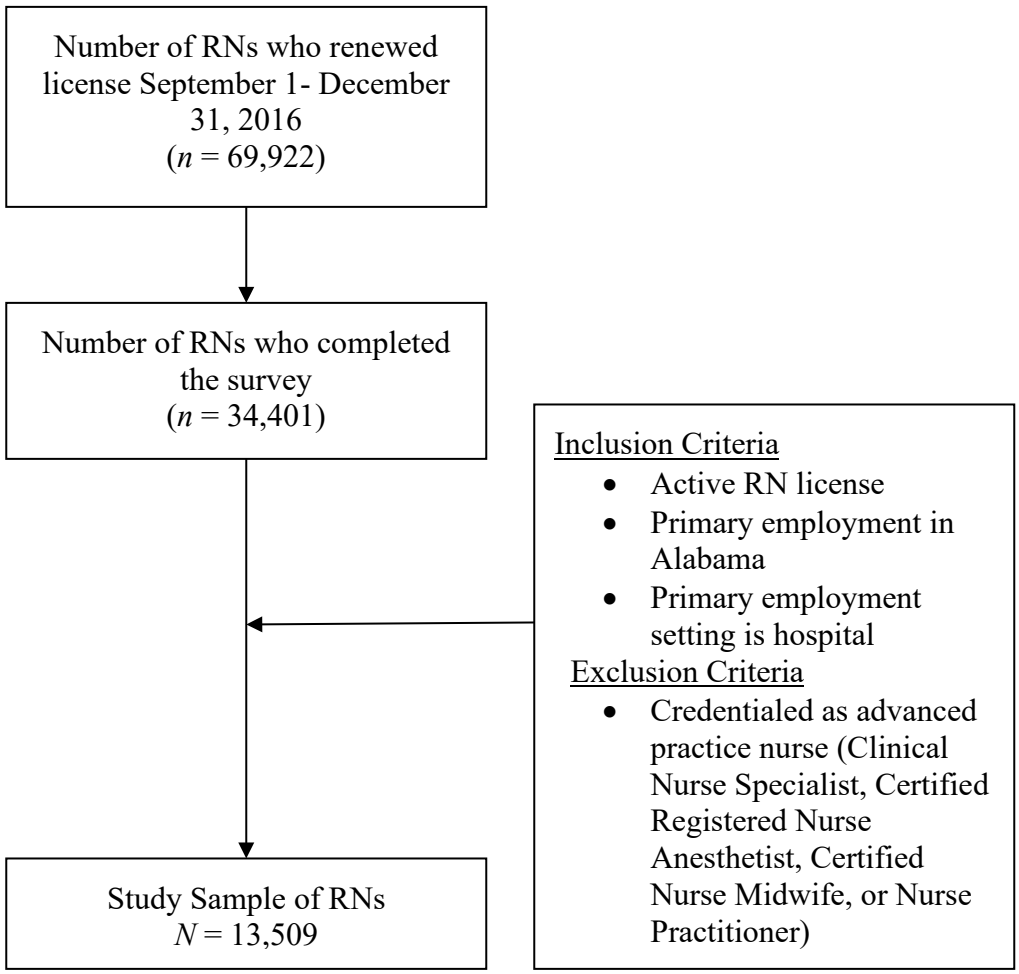
Licensing as an RN professional in Alabama occurs through the ABN. License renewal requires submission of a license renewal fee, evidence of meeting continuing education requirements, and completion of required regulatory questions. License renewals occur on a biennial calendar schedule from September 1 through December 31. All RNs, including those only recently issued a license to practice in the state as an RN, must participate in the license renewal process at these biennial calendar times. This study sample was derived from data collected at the time of license renewal in 2016 and 2018. A voluntary survey was embedded in the license renewal process by the ABN. Successful renewal of the RN license was not contingent upon survey participation. Entry and completion of the voluntary survey questions was preceded by a statement explaining the voluntary nature of the survey.

Study Sample 2016 Data

The total number of RNs in Alabama who renewed a license during the 2016 license renewal period was 69,922. Voluntary survey participants from this population were 34,401, representing 49% of the total number of renewing RNs. Study inclusion and exclusion criteria were applied, resulting in a final sample study of 13,509 RNs (see Figure 4).

Figure 4

Sample Selection 2016 Supply Data

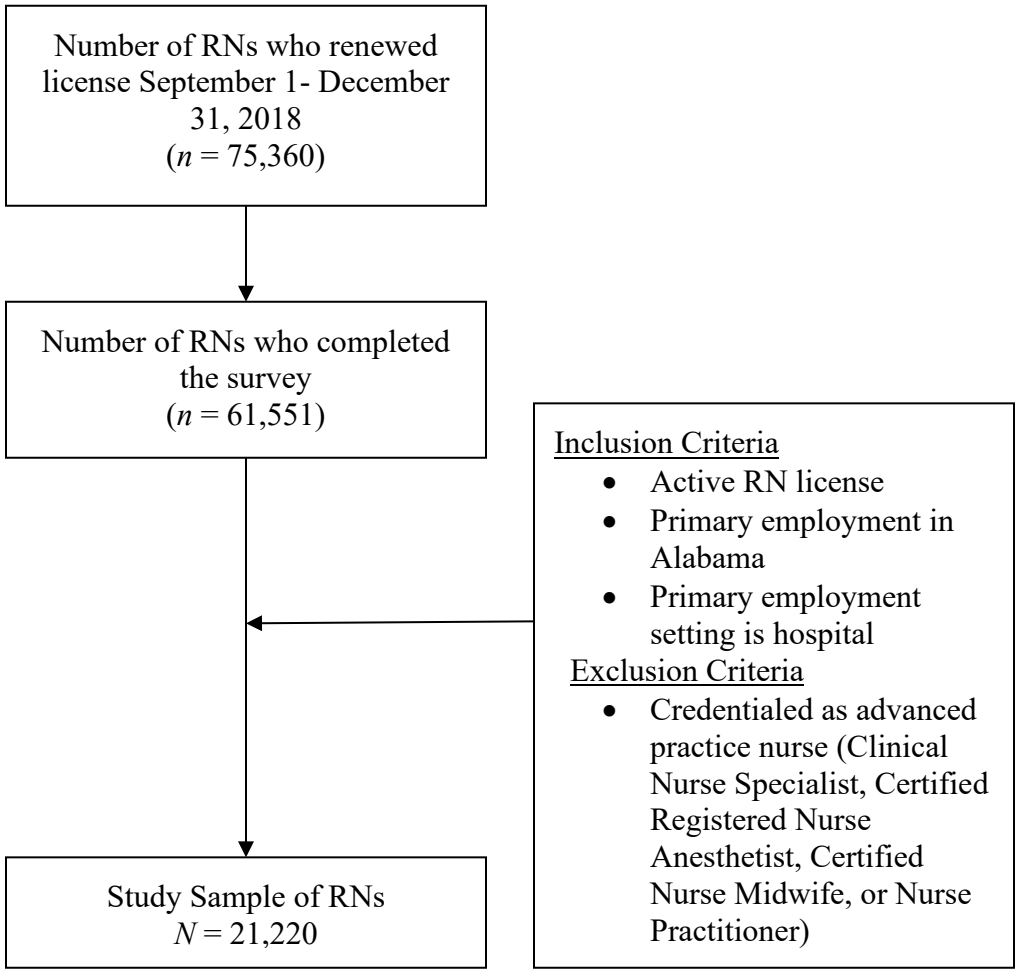


Study Sample 2018 Data

The total number of RNs in Alabama who renewed a license during the 2018 license renewal period was 75,360. There were 61,551 voluntary survey participants, representing 82% of the total number of renewing RNs. Study inclusion and exclusion criteria were applied, resulting in a final sample study of 21,220 RNs (see Figure 5).

Figure 5

Sample Selection 2018 Supply Data



Demand

The sample representing the demand for acute care RNs was recruited at a hospital facility level. All 90 facilities identified as part of the target population were mailed the initial survey recruitment materials. No materials were returned to the researcher as undeliverable. Sixty-two of the potential study participants were also linked to email addresses that allowed the electronic distribution of the study information along with a Qualtrics® link to an electronic version of the *Survey of Acute Care Registered Nurse Employers in Alabama 2019*. Qualtrics® for electronic survey distribution also returned information about the number of surveys completed, the number of surveys started but not completed, and the number of surveys that were undeliverable. For this study, regions within Alabama were defined by the AlabamaWorks! (https://alabamaworks.com/) initiative. This initiative was undertaken by the Alabama Workforce Council in 2015 with the goal of establishing a unified network to better understand the Alabama workforce system. Figure 6 displays the Alabama regions used by AlabamaWorks! as well as this study.

Figure 6

Alabama Regions Represented in Study

Region	Counties Included	
1	1. Colbert 2. Cullman 3. DeKalb 4. Franklin 5. Jackson 6. Lauderdale 7. Lawrence	8. Limestone 9. Madison 10. Marion 11. Marshall 12. Morgan 13. Winston
2	1. Calhoun 2. Cherokee 3. Clay 4. Cleburne	5. Etowah 6. Randolph 7. Talladega
3	1. Lamar 2. Pickens 3. Sumter 4. Fayette 5. Tuscaloosa	6. Bibb 7. Greene 8. Hale 9. Marengo
4	1. Blount 2. Chilton 3. Jefferson	4. Shelby 5. St. Clair 6. Walker
5	1. Autauga 2. Bullock 3. Chambers 4. Coosa 5. Dallas 6. Elmore 7. Lee	8. Lowndes 9. Macon 10. Montgomery 11. Perry 12. Russell 13. Tallapoosa
6	1. Houston 2. Geneva 3. Covington 4. Henry 5. Dale	6. Coffee 7. Crenshaw 8. Butler 9. Barbour 10. Pike
7	1. Baldwin 2. Mobile 3. Washington 4. Choctaw 5. Clarke	6. Wilcox 7. Monroe 8. Conecuh 9. Escambia

All geographic regions were represented in the final study sample, but the number and size of facilities represented varied between regions. Twenty-eight percent (n=25) of the chief nursing officers (CNOs) and directors of nursing (DONs) who were sent an invitation to participate provided survey responses. Table 7 summarizes the final study participation.

Table 7

CNO/DON Representation

Region	Total # of licensed beds	# of beds represented	% of beds represented	Total # of hospitals	# of hospitals represented	% of hospitals represented
1	3,041	882	29.0%	17	6	35.3%
2	1,488	870	58.5%	9	4	44.4%
3	876	144	16.4%	9	3	33.3%
4	4,857	1,862	38.3%	15	4	26.7%
5	1,916	319	16.6%	12	2	16.7%
6	1,453	154	10.6%	11	2	18.0%
7	2,622	99	3.8%	17	3	17.6%
Not specified					1	
Total*	16,253	4,330	26.7%	90	25	27.7%

*Note.** Total based upon available data

Results

Aim 1

Study Aim 1 was to characterize the current supply of acute care hospital RNs in Alabama.

RQ 1: How many RNs were licensed and employed in Alabama's acute care hospitals in 2016? In 2018?

RQ 2: What are the demographics (age, ethnicity, race, gender) of RNs licensed and employed in Alabama's acute care hospitals in 2016? In 2018?

Supply

Gender, Ethnicity, and Race

The 2016 study sample of acute care RNs consisted of 13,509 unique survey respondents. The sample was predominantly female (88.4%), not of Hispanic/Latino ethnicity (99.1%), and White/Caucasian (80%). The 2018 acute care RN sample consisted of 21,220 unique survey respondents. The 2018 sample was comparable to the 2016 sample, with the largest part of the sample representing the White/Caucasian race (81.0%) and female gender (90.6%). There was a slight increase in the 2018 sample of respondents who reported ethnicity of Hispanic or Latino origin (see Table 8).

Age

The distribution of age groups across both the 2016 and 2018 samples was consistent. Individuals reporting to be 60 years or older represented approximately 10.2% in the 2016 sample but approximately 12.6% of the 2018 sample. Comparatively, the two youngest age groups showed a slight decline in percentages represented between the samples. The age group 20-29 years made up 21.9% of the sample in 2016 but was slightly lower (19.5%) in 2018. Similarly, the 30-39 years age group in 2016 represented 24.5% but was slightly lower (23.8%) in 2018 (see Table 8).

Table 8

Supply Demographic Characteristics

Characteristic	2016		2018	
	n	%	*n*	%
Gender[a]				
Female	11,113	88.4	19,078	90.6
Male	1,458	11.6	1,990	9.4
Ethnicity[b]				
Hispanic or Latino Origin	111	0.9	363	1.7
Not Hispanic or Latino Origin	12,152	99.1	20,711	98.3
Race[c]				
White/Caucasian	10,658	80.0	17,004	81.0
Black/African American	2,034	15.0	3,117	15.0
Multiracial	143	1.0	443	2.0
Asian	147	1.0	206	1.0
American Indian or Alaska Native	60	<1	64	<1
Native Hawaiian or Other Pacific Islander	10	<1	13	<1
Other	100	<1	156	<1
Age Group (Years)[d]				
20-29	2,954	21.9	4,002	19.5
30-39	3,311	24.5	4,893	23.8
40-49	3,010	22.3	4,797	23.4
50-59	2,757	20.4	4,230	20.6
60-69	1,376	10.2	2,302	11.2
70-79	94	<1	292	1.4
≥80	7	<1	4	<1

Note. Percentages reflect valid percent. [a] $N = 12,571$ (2016) and $N = 21,068$ (2018). [b] $N = 12,263$ (2016) and $N = 21,074$ (2018). [c] $N = 13,263$ (2016) and $N = 21,003$ (2018). [d] $N = 13,509$ (2016) and $N = 20,520$ (2018).

Highest Level of Education

A full decade ago, the Institute of Medicine (2011), now the National Academy of Medicine, released *The Future of Nursing* report that included a recommendation to

"Increase the proportion of nurses with a baccalaureate degree to 80 percent by 2020" (p. 3). Although this initiative has been widely promoted, the highest level of educational preparation among Alabama's acute care RNs reflects little change. In 2016, the largest percentage of the sample reported the highest nursing degree held as an associate degree in nursing (ADN, 45%), while a baccalaureate degree (BSN) was reported by 40%. In 2018, there was a widening gap between these two options for academic preparation. Fifty-one percent reported the highest nursing degree held as an Associate Degree in Nursing, while 39% reported a BSN (see Table 9).

Table 9

Highest Level of Education

Degree	2016[a]		2018[b]	
	n	*%*	*n*	*%*
Diploma	339	3.0	458	2.0
Associate	5,964	45.0	10,749	51.0
Baccalaureate	5,398	40.0	8,348	39.0
Master's	671	5.0	1,082	5.0
Doctoral (PhD)	6	<1	48	<1
Doctoral (DNP)	26	<1	100	<1
Doctoral (other)	5	<1	14	<1
Degree in Other Field	976	7.3	421	2.0

Note. Percentages reflect valid percent. [a] $N = 13,385$. [b] $N = 21,096$.

Number of Current Positions and Number of Hours Worked in a Typical Week

Identifying what is known about the employment patterns of nurses is the first step toward determining what additional knowledge needs to be gained. Russo et al. (2018) conducted a scoping review that identified reasons nurses participate in

simultaneous employment opportunities. The researchers posit that this practice is underreported. Their review found that holding more than one position simultaneously demonstrates not only the economic need to increase salary, but also may suggest dissatisfaction with the primary position. The 2016 and 2018 samples reported similar employment patterns. Most respondents (87%) reported employment in one nursing position. However, each sample also had approximately 11% of the respondents report simultaneous employment in two positions.

For this study, the number of reported hours worked in a typical week were converted to FTEs. Individuals who reported working less than or equal to 32 hours per week were assigned 0.5 FTE. Those individuals who reported working more than or equal to 33 hours per week were assigned 1.0 FTE. The 2016 sample was found to contribute a total of 12,432.5 FTEs in a typical week. The ratio of nurses who reported full-time employment to part-time employment was 6.2:1. The 2018 sample was larger than the 2016 sample, and thus contributes a higher total number (19,008) of FTEs in a typical week. However, there was a noted shift in FTE contribution with the ratio of nurses who reported full-time employment to part-time employment as 4.7:1.

Plans to Retire or Leave Nursing Workforce and Year of Initial Licensure

Anticipating attrition from the workforce is vital as it enables planning for adequate workforce replacement. The 2016 and 2018 samples differed in plans to retire or leave the nursing workforce. There was a 6-percentage point increase in 2018 for respondents reporting intent to leave the workforce within 5 or 10 years (see Table 10).

Table 10

Plans to Retire or Leave Nursing Workforce

Time	2016[a]		2018[b]	
	n	*%*	*n*	*%*
Within next 5 years	1,333	9.9%	2,769	13.3%
Within next 10 years	1,567	11.7%	2,986	14.3%
Total	2,900	21.6%	5,755	27.6%

Note. Percentages reflect valid percent. [a] $N = 13{,}402$. [b] $N = 20{,}869$.

For this study, the year of initial licensure was used as a proxy for experience. The 2016 and 2018 samples differed in their representation from years of licensure, with the 2018 samples suggesting a decline in workforce participation for those having greater than 10 years of nursing experience (see Table 11).

Table 11

Year of Initial Licensure

Year	2016[a]		2018[b]	
	n	*%*	*n*	*%*
1989 or before	1,962	15.3	2,822	15.0
1990 through 1999	2,358	18.4	1,557	8.3
2000 through 2009	3,187	24.9	3,686	19.6
2010 through 2018	5,306	41.4	10,742	57.0

Note. Percentages reflect valid percent. [a] N=12,813. [b] N=18,807.

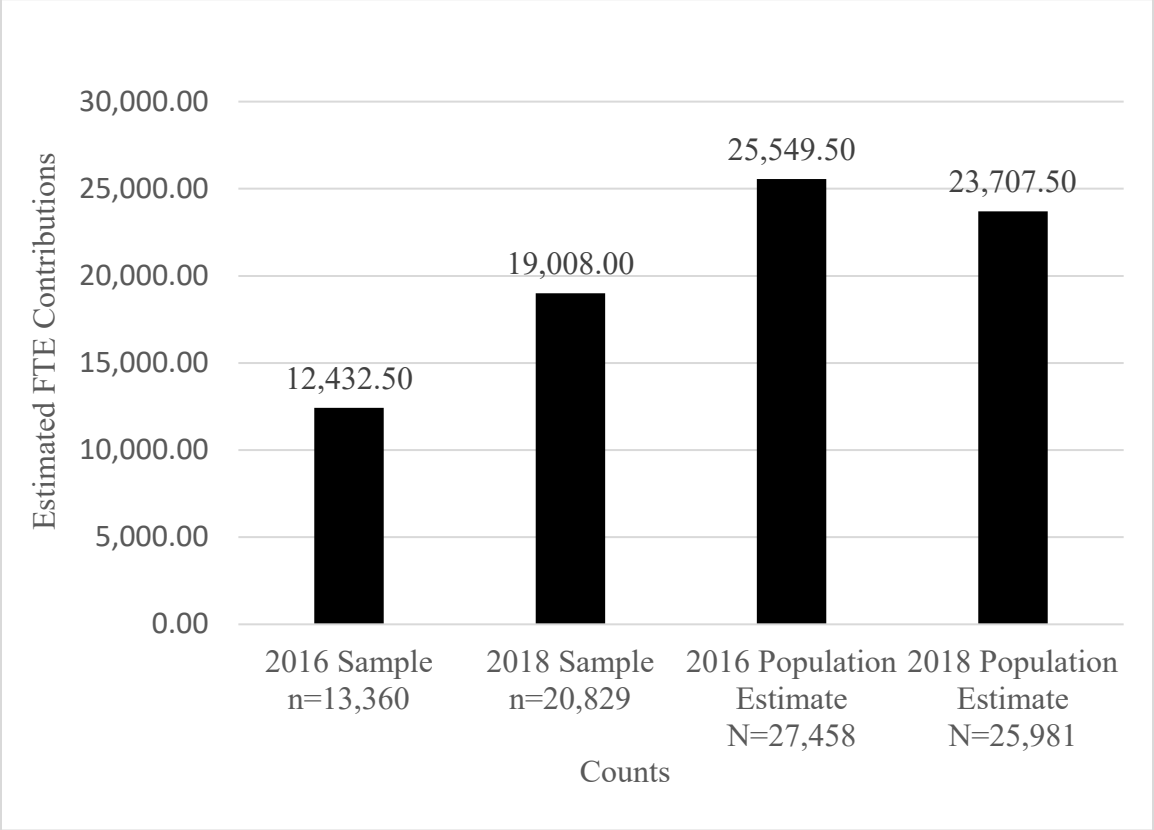
Population Estimates

To answer research question 1, the researcher extrapolated from sample findings and estimated the size of the target population of acute care RNs in Alabama. Population count estimates were obtained by comparing the number of participants who met study inclusion/exclusion criteria to the number who completed the voluntary survey. This proportion was then extrapolated to the total number of RNs who participated in license renewal during the specified renewal period. This provided an estimation that the actual 2016 acute care RN workforce providing frontline care would have been approximately 27,458 nurses. The estimate of the 2018 acute care RN workforce providing frontline care was 25,981 nurses.

Application of the FTE contributions previously determined by analyzing sample data demonstrated an estimated decrease of total acute care RN workforce FTE contribution between 2016 and 2018. Estimated FTE contributions are presented in Figure 7.

Figure 7

Estimated FTE Contributions of Acute Care Registered Nurses in Alabama



Regional Aggregation

In addition to state-level aggregation, survey participants were also associated with the regions defined in this study based upon responses to a single question in the voluntary survey soliciting information about the zip code of primary employer. All regions were represented by respondents in both the 2016 and 2018 surveys. Regions one, four, five, and seven were associated with the greatest percentage of respondents during both license renewal periods. This is congruent with the expected distribution of acute care RNs in Alabama, as each of these regions has at least one very large health system associated with the area (see Table 12).

Table 12

Sample Regional Representation

Region	2016[a]		2018[b]	
	n	*%*	*n*	*%*
1	2,513	18.7	3,282	19.0
2	873	6.5	1,021	5.9
3	846	6.3	888	5.1
4	4,691	34.9	6,004	34.8
5	1,641	12.2	2,671	15.5
6	882	6.6	1,003	5.8
7	1,990	14.8	2,388	13.8

Note. Percentages reflect valid percent. [a] $N = 13,436$. [b] $N = 17,257$.

Public Data

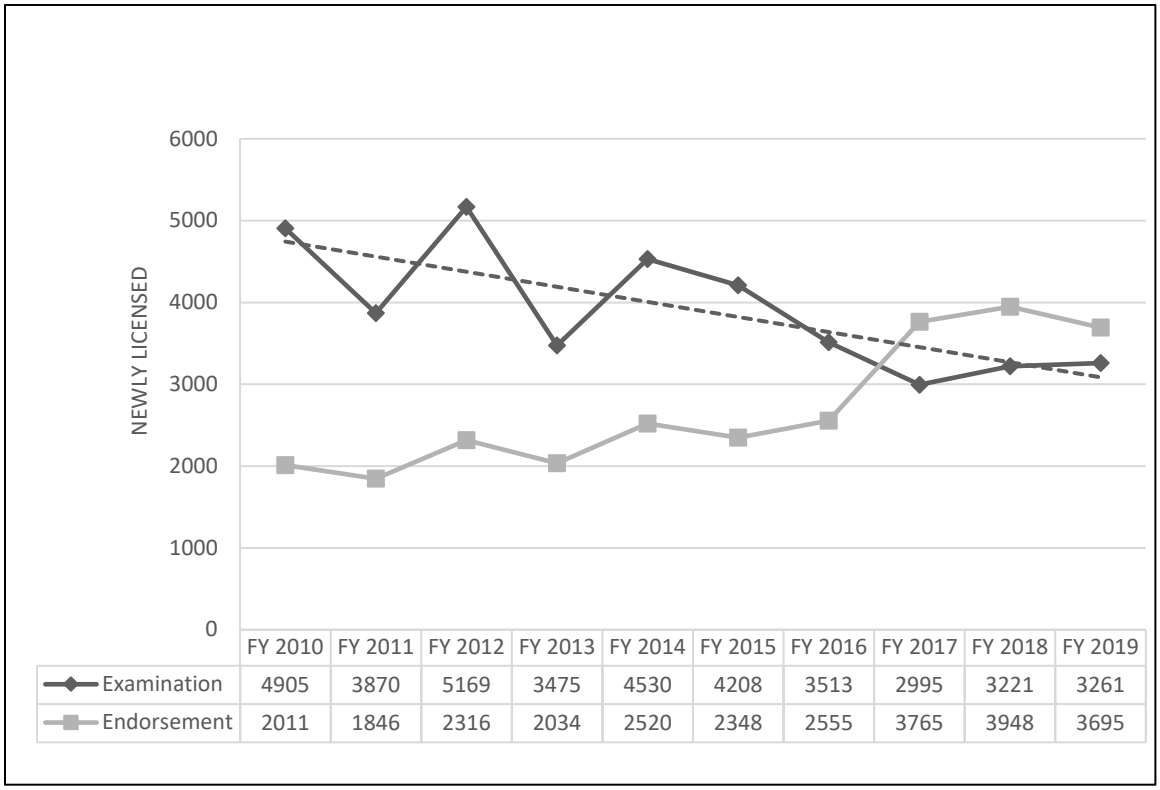
Alabama Board of Nursing Annual Reports

The ABN, as the state's regulatory authority for nursing practice, publishes an annual report on its website (https://www.abn.alabama.gov/) for each fiscal year. Annual reports include a summation of new Alabama licenses issued during the fiscal year. This information is important in understanding the inflow of licensed RNs to the workforce. The data reported for each fiscal year from 2010 to 2019 were reviewed. Licensure as the result of examination occurs for individuals who apply for initial licensure after having completed education requirements and successfully passed the NCLEX-RN licensing exam administered by the National Council of State Boards of Nursing. Licensure by endorsement occurs when a nurse who is already licensed to practice in another state applies to the ABN for licensure in Alabama. The data represent all RNs, not specifically those who practice in acute care. The data show a trend over the last decade that reflects a declining number of licenses issued due to examination (i.e., new graduate nurses), while

licenses issued due to endorsement have increased. A summary of Alabama's new licensure data is presented in Figure 8.

Figure 8

Alabama Board of Nursing Licensure Report



	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019
Examination	4905	3870	5169	3475	4530	4208	3513	2995	3221	3261
Endorsement	2011	1846	2316	2034	2520	2348	2555	3765	3948	3695

Source: Public data retrieved from https://www.abn.alabama.gov/

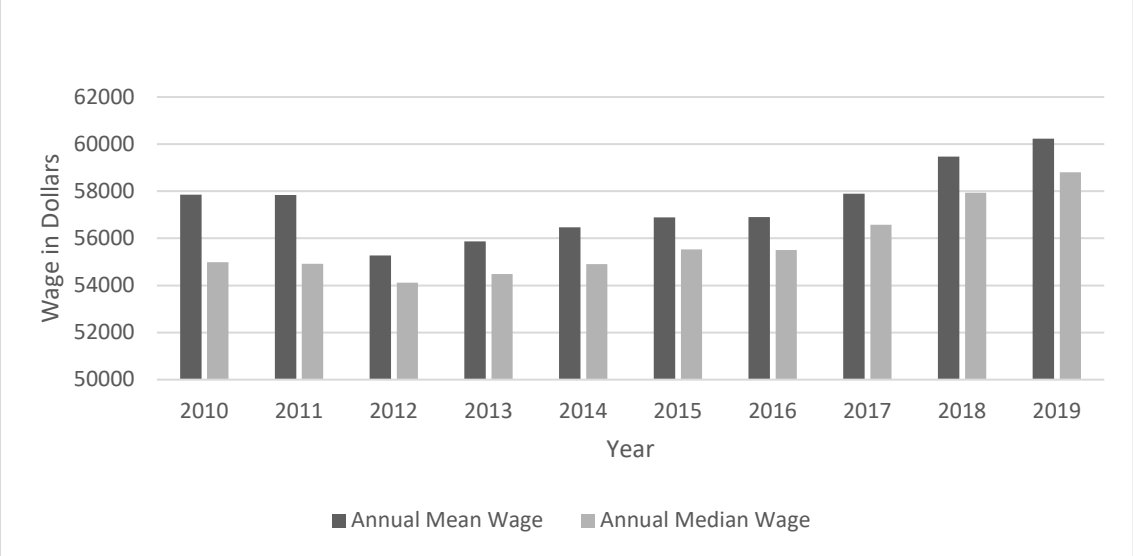
U.S. Bureau of Labor Statistics Occupational Employment Statistics

Economics principles are essential to consider when evaluating the supply and demand of a labor market. The law of supply suggests that when all other things are held constant, a higher wage will increase the amount of a good (in this case, RN labor) supplied (Mankiw, 2018). Conversely, the law of demand suggests that when all other

things are held constant, the amount of a good demanded falls as the price rises (Mankiw, 2018). Markets adjust to reach a point of equilibrium. The U.S. Bureau of Labor Statistics publishes Occupational Employment Statistics, which provide information about wage estimates during May of each calendar year. Since wage is believed to impact supply and demand, the data were reviewed. The published data are categorized as pertaining to the occupation designation of RN, not specific to those nurses who practice in the acute care setting. However, there was not another source identified by the researcher that could provide longitudinal trending of wages. The wage estimates found in the Occupational Employment Statistics database are presented in Figure 9.

Figure 9

Registered Nurse Salaries in Alabama



Note. Public data retrieved from https://www.bls.gov/oes/home.htm

Because entry into the nursing workforce as an RN most often requires three years (ADN) or four years (BSN) of entry-level educational preparation, increasing the

supply of new RNs in response to higher wages would be expected to occur in the long run rather than the short run (Buerhaus, Staiger, & Auerbach, 2009). A short-run increase in labor supply could only come from RNs who are already licensed and choose to immediately increase their level of workforce participation (Buerhaus, Staiger, & Auerbach, 2009). As noted in Figure 9, the wages for RNs in Alabama have demonstrated a pattern of increase since 2016. Based on the ABN licensure reports, entrants to the workforce by examination decreased in fiscal year 2016 and have increased only slightly each year since 2017. Comparatively, RNs entering the workforce through license endorsement have substantially increased annually since 2016. What remains unclear is how many of these entrants work at an acute care facility as frontline RNs.

Aim 2

Study Aim 2 was to characterize the current demand for acute care hospital RNs in Alabama.

RQ 1: What was the 2019 demand for RNs practicing in Alabama's acute care hospitals?

RQ 2: What was the 2019 number of RN full-time equivalents (FTEs) budgeted for in Alabama's acute care hospitals?

RQ 3: What was the number of budgeted RN FTEs unfilled in 2019?

RQ 4: In what areas (specialties, units) were Alabama's greatest acute care hospital RN staffing needs in 2019?

Demand for RNs practicing in Alabama was investigated using the *Survey of Acute Care Registered Nurse Employers in Alabama 2019.* There was a total of 25 survey

responses, which equated to a 28% response rate. Not all survey questions were answered by all respondents.

Survey Findings

Perception of Labor Market

Chief nursing officers (CNOs) and directors of nursing (DONs) were asked to describe their perception of the current overall labor market for acute care RNs. Sixty-eight percent of the CNOs/DONs who responded to the survey described the overall labor market for acute care RNs as high demand with difficulty filling open positions. That percentage increased to 80% when they were queried about the demand for experienced RNs. When explicitly asked about the labor market for new graduate RNs, the perception of high demand decreased slightly to 54.2%, and there were suggestions that demand is in balance with supply (4.2%) or demand is less than supply (12.5%) (see Table 13).

Table 13

CNO Perception of RN Labor Market

Level of Demand	Overall[a]		Experienced[b] RNs		New Graduate[c] RNs	
	n	%	*n*	%	*n*	%
High Demand (Difficulty filling positions)	17	68	20	80	13	54.2
Moderate Demand (Some difficulty filling positions)	6	24	4	16	7	29.2
Demand = supply	2	8	1	4	1	4.2
Demand < supply	0		0		3	12.5

Note. Percentages reflect valid percent. [a] $N = 25$. [b] $N = 25$. [c] $N = 24$

Areas with Greatest Staffing Needs

A variety of specialty areas and units were reported as having RN positions open that were difficult to fill. The top areas identified included: 1) medical-surgical (72%), 2) emergency room (72%), and 3) operating room (36%). The findings are summarized in Table 14.

Table 14

RN Positions Difficult to Fill

Position	*n*	*%*
Medical-Surgical	18	72
Emergency Room	18	72
Operating Room	9	36
Adult Critical Care	7	28
Unit-Level Nurse Managers	6	24
Cardiac Cath Lab/ Special Services	3	12
Labor & Delivery/ Postpartum Care	2	8
Telemetry	2	8
Case Managers/ Discharge Planners	1	4
Oncology	1	4
Pre and Post Anesthesia Care Unit	1	4
Rehabilitation	1	4
Pediatrics	1	4
Nurse Administrators	1	4

Note. $N = 25$. Response percentages do not sum to 100% due to multiple answers selected.

Changes in Employment During the Past Year

When asked about changes in employment of *staff* RNs during the past year, 7 survey respondents (28%) reported a decrease in employment numbers, 14 (56%) reported no change in the number employed, and 4 (16%) reported an increase in the number employed. Results were similar when the respondents reported changes in the

employment of *other* RN positions. Positions classified as *other* RN positions were not specified in the survey tool. Respondents were asked to provide information about what *other* positions were being reported on. A variety of positions were listed in response: 1) certified nursing assistants (CNAs), 2) unit secretaries, 3) PRN (as needed) nurses, 4) emergency nurses, 5) psychiatric/behavioral health nurses, 6) in-house contract nurses, 7) medical-surgical nurses, and 8) pre-anesthesia assessment nurses. A few of these positions listed could have appropriately been considered as staff RN positions. In contrast, others did not seem to represent nursing positions at all (i.e., certified nursing assistants and unit secretaries). This suggests that respondents to the survey may define their demand for nurses in different ways, and traditional support personnel may be categorized within the nursing services budget at some acute care facilities.

Several factors were identified as contributing to changes in patterns of employment over the previous year. Factors that were cited by at least 20% of survey respondents are summarized in Table 15.

Table 15

Factors Impacting Facility Demand for RNs in the Last Year

Factor	*n*	*%*
Decrease in use of travel RNs	5	20
Increase in use of temporary or travel RNs	6	24
Greater turnover; less retention of RNs	14	56
More RNs retiring than expected	6	24
Increased patient acuity	12	48
Increase in services provided by RNs	5	20
Creation of new RN positions	7	28

Note. N = 25. Response percentages do not sum to 100% due to multiple answers selected.

New job classifications for RNs were created at eight (32%) of the facilities during the previous year. New job classifications that were reported included: 1) informatics RN, 2) nurse navigators, 3) super float pool RNs, 4) nurse educators for new graduates, 5) surgical services education coordinators, 6) director of surgical services, 7) RN residents, 8) RN interns, 9) quality improvement roles, 10) new PRN nursing tiers, 11) additional career ladder levels, and 12) seasonal RNs.

Recruiting

Recruiting for *staff* RNs was reported by 16 respondents (64%) as more difficult than usual. Eight (32%) reported that the level of difficulty for recruiting was about the same as in previous years. Six (24%) respondents reported that their organization offers an RN residency program to assist new graduates in the transition to practice.

Recruiting for *other* RN positions during the last year was represented differently. Only 7 (31.3%, $n = 21$) reported more difficulty recruiting. Positions that respondents identified as included in the reporting as *other* RN positions included: 1) nursing leadership, 2) case management, 3) quality/accreditation RNs, 4) in-house contract RNs, 5) medical-surgical RNs, 6) emergency room nurses, and 7) certified nursing assistants. Two respondents wrote additional information to elaborate:

"It is difficult to find qualified nurse managers, house supervisors, and CNOs.
We can't find qualified CNAs and then when we do, we can't seem to keep them.
Lots of turnover as they look for who is offering the most money."

Changes in Employment for Next Year

Respondents were asked to consider what expectations were for RN employment during the next year. Fifteen (60%) anticipate that total employment will not change,

while 10 (40%) reported that they expect employment numbers to be higher. In aggregate, the survey respondents estimated additions of 267 full-time RN positions (267 FTE) and 115 part-time positions (57.5 FTE) during the next year. The reasons for these anticipated changes in RN employment numbers were varied. Table 16 summarizes those findings.

Table 16

Factors Impacting Future RN Employment

Factor	*n*	*%*
Decrease in use of travel RNs	4	16
Greater turnover; less retention of RNs	3	12
Current RNs are working more shifts	4	16
Increase in hospital bed capacity	6	24
More RNs retiring than expected	4	16
Increased patient acuity	6	24
Increase in services provided by RNs	5	20

Note. $N = 25$. Response percentages do not sum to 100% due to multiple answers selected.

Educational Preparation and Benefits

When asked about RN educational preparation, 23 (93%) of the survey respondents reported that their organization does not require newly hired nurses with less than a BSN degree to pursue a BSN degree. Additionally, only 5 (20%) reported offering a pay differential based upon the nursing degree held. However, 13 (52%) reported that their organization does provide some type of support to RNs who are enrolled in an educational program in pursuit of a higher degree. Types of support were reported as: 1) scheduling options (23%), 2) scholarships (31%), and 3) tuition reimbursement (69%).

Quantitative Measurements of Demand

Survey respondents were asked to provide specific information about their current number of RN full-time and part-time permanent positions filled, unfilled, and/or being actively recruited for. Additionally, the number of RN separations during the last year, per-diem hours used in an average week, and information about the use of temporary (agency/travel) staffing was requested to support quantitative measurements of workforce demand. Response rates for the 11 survey questions required for calculations of the quantitative measures of demand were low. Twelve (48%) of the respondents failed to provide some, if not all, of the information needed for all the measurement calculations.

In addition to missing data, which were missing not at random (MNAR), all quantitative data that were supplied were evaluated for internal consistency. One respondent reinforced the need for this by providing a comment within the survey noting confusion over what was being asked by one of the questions. During data analysis, it was determined that several of the survey questions intended to collect quantitative measures were interpreted in more than one way. Gross numerical incongruencies between related survey questions introduced concerns that some of the data received were not reliable. To further investigate concerns about data reliability, data from the *American Hospital Association (AHA) 2018 Annual Survey* were accessed and used for comparison and substitution purposes. The AHA survey data do not include any information about unfilled positions; however, they served to further inform the number of full-time RNs, part-time RNs, and RN FTEs for the hospitals that contributed to the current study sample.

Sample Results

Full-Time Equivalents Budgeted

Seventeen respondents (68%) provided data needed to perform calculations for the FTEs, which were budgeted. These same respondents submitted data that allowed for the calculation of FTEs filled. The AHA data for FTEs employed was used for comparison. Table 17 summarizes these three values.

Table 17

Full-Time Equivalents Budgeted Versus Filled

Category	Reported in This Study		AHA Data
	Budgeted FTE[a]	Filled FTE[a]	Filled FTE[b]
Bed Size			
≤100	378	338	504*
101-200	558	530.5	563*
201-300	1368	1269	1051*
≥301	3975	3650	3678
Region			
1	1257	1168.5	1035
2	321	285	559
3	99	90	103
4	4293.5	3959	3983*
5	272	255	54*
6			
7	36.5	30	62*
Total	6279	5787.5	5796

Note. *Reflects missing data from one survey respondent included in section "Reported."

[a] $N = 17$. [b] $N = 14$.

The AHA data reported in Table 17 represent a sample size of $N = 14$. The difference in sample sizes between the reported data and AHA data reflects that three of

the study organizations that reported data were not found in the AHA database. Those organizations combined reported 226 FTEs filled that are not reflected in the AHA data. Regardless, there is a lower number of filled FTEs compared to budgeted FTEs when considering both the reported and AHA data. The reported information reveals a deficit of 491.5 FTE. The AHA data suggest a deficit of 483 FTE. If an assumption is made that an additional 226 filled FTE (as reported by the three respondents not found in the AHA data set) is accurate and added to the AHA data, the FTE deficit would reduce to 257 FTE.

Unfilled Full-Time Equivalents

The survey tool included specific questions to allow calculation of the current number of unfilled positions. The number of unfilled positions reflect positions that are budgeted for but may be different from the reported number of unfilled positions that are being actively recruited for. These measures serve to inform vacancy rates, the inability to fill RN positions, and thus employer demand (Hisgen et al., 2018). The AHA data were not used to provide comparisons, as unfilled positions are not recorded in AHA data. In the study sample, 19 survey respondents (76%) provided either the number of unfilled positions or the number of unfilled positions being actively recruited for. The total number reported by the 19 respondents was 556 unfilled FTEs (see Table 18).

Table 18

Reported Unfilled FTEs

Category	Reported Budgeted Unfilled FTEs
Bed Size	
≤100	67
101-200	27.5
201-300	99
≥301	362.5
Region	
1	88.5
2	73.5
3	9
4	334.5
5	17
6	27
7	6.5
Total	556

Note. $N = 19$

Vacancy Rates

A high vacancy rate may signal difficulty recruiting and retaining nurses. Evaluating hospital-level vacancy rates using the data provided by the study's respondents raised questions about the validity of the survey data received. Using the calculation for vacancy (FTE) rate, the reported vacancy rates ranged from 1% to 55%. To address the uncertainty of the data, a sample average vacancy rate was calculated. Like prior analysis, this vacancy rate was calculated using the sum of actual data supplied by respondents and, for comparison, substituting the AHA 2018 survey data for filled

FTEs in the calculation. Using the respondent-reported data produced a vacancy rate for the sample of hospitals as 7.8%. Using the AHA data produced a vacancy rate of 7.7%.

Turnover Rates

High turnover rates, which measure movement of persons, may suggest a problem with employee satisfaction, which may increase a facility's demand for RNs due to attrition from the facility or workforce. Only 6 (24%) of the survey respondents provided information that could legitimately inform turnover rates. Turnover rates were found to range between 6% and 27%. Since there were no other data sources identified that could contribute more information on employee separations, no further analysis was done.

Plans to Add New Positions

Fifteen (60%) of survey respondents reported plans to add new RN positions with their organization during the next year. In total, there were 257 new full-time positions and 115 new part-time positions anticipated for future hiring needs. This equates to 314.5 FTEs that will increase the demand for acute care RNs for those 15 organizations.

Regional- and State-Level Aggregation

The data collected utilizing the *Survey of Acute Care Registered Nurse Employers in Alabama 2019* provided insight into a percentage of acute care facilities in Alabama. The inability to confirm the representativeness of the sample and the small sample size prevented the ability to perform meaningful regional- and state-level aggregation. Weighting the demand data was considered by the researcher but determined not appropriate for this study due to the increase in risk of reporting inaccurate data, in addition to the questions already addressed above about data consistency and reliability. Furthermore, Thomas (2017) cautioned against weighting when the sample size is small.

Aim 3

Study Aim 3 was to estimate future supply of and demand for acute care hospital RNs in Alabama.

RQ 1: What is the estimated future supply of RNs licensed and employed in Alabama's acute care hospitals in 2 years (2020)? in 5 years (2023)?

RQ 2: What is the estimated rate of retirement of RNs licensed and employed in Alabama's acute care hospitals in 5 years (2023)? in 10 years (2028)?

RQ 3: What is the estimated future demand for RNs licensed and employed in Alabama's acute care hospitals in 2 years (2020)? in 5 years (2023)?

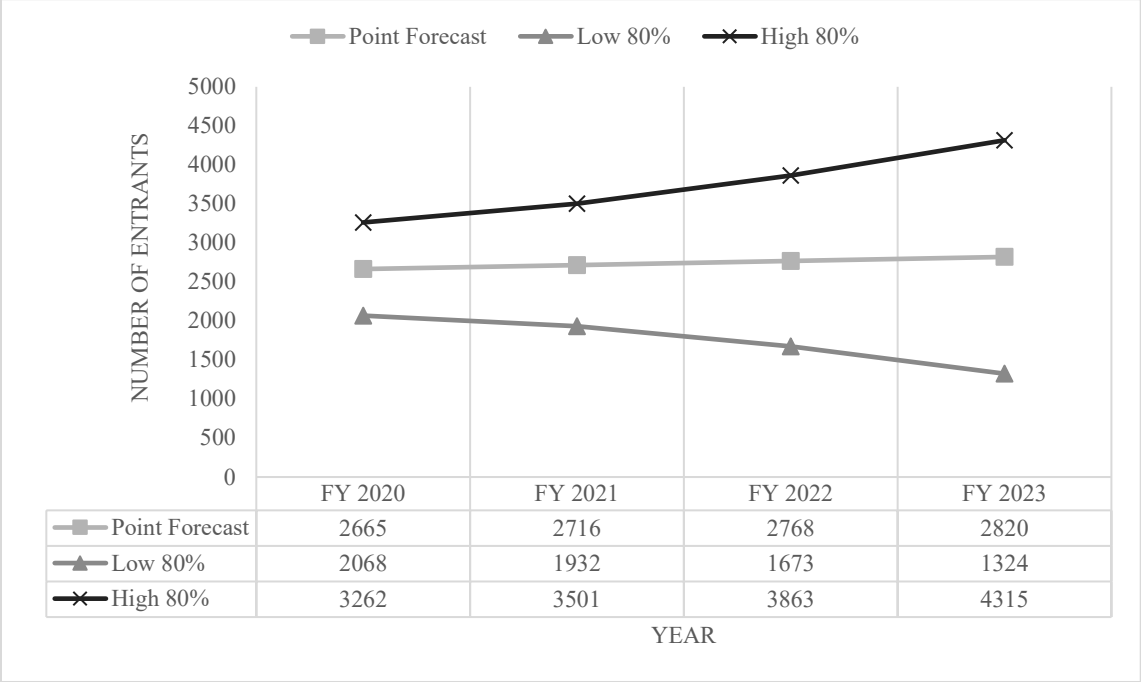
Estimated Future Supply

This study analyzed cross-sectional supply data at two time points. To estimate future supply, the public data published by the ABN in Annual Reports were used to determine the new entrants (new licensees by examination + licensees by endorsement) to the entire RN workforce. Then, based upon the survey data from 2016 and 2018, a percentage of new entrants was estimated for future entry into the acute care RN workforce.

The Holt-Winters method was applied using open-source R statistical software (https://www.r-project.org/). This time series method for plotting is used to forecast data points in a series, with 80% and 95% prediction intervals (Coghlan, 2018). An 80% prediction interval was chosen for this study. Figure 10 summarizes the findings. These estimates provide a best-case scenario of greater than 3,000 RNs entering acute care each year versus a worst-case scenario of 2,000 or fewer RNs entering annually.

Figure 10

Prediction of New RN Entrants to Acute Care



Estimated Rate of Retirement

In 2016, 9.9% of survey participants reported a plan to retire or leave the nursing workforce within 5 years, and 11.7% planned to retire or leave the nursing workforce within 10 years. These percentages increased in 2018. In 2018, 13.3% reported a plan to leave the workforce within 5 years, while an additional 14.3% reported a plan to leave within 10 years. Workforce planning requires an understanding of not only the number of potential entrants to the workforce but also the consideration of planned attrition. Based upon the 2018 data, the rate of retirement within 5 years (2023) is 13.27, and the rate of retirement within ten years (2028) is 14.3. Based upon the sample size, this means that at least 5,755 RNs will be lost to attrition over the next 10 years. Extrapolating that number

out to the 2018 target population estimate of 25,981 RNs, the minimum planned attrition from the acute care workforce would more likely be closer to 7,110 RNs.

Estimated Future Demand

Due to the limited data that were collected providing a quantitative measurement of current demand, the ability to estimate future demand is severely limited. To answer research question #3, a forecasting model would need to have time series data that could provide enough historical data to estimate future needs. The data analysis for this study provided information to suggest that there is a current deficit in filled FTEs (shortage). Additionally, there was a report of the intent to create new positions in the immediate future by some facilities that participated in the study. These two factors suggest that demand for acute RNs will increase in the immediate future even with all other potentially influencing factors, like an aging population, held constant.

Aim 4

Study Aim 4 was to forecast whether future acute care hospital RN supply will meet future acute care hospital RN demand in Alabama.

RQ 1: Will Alabama's acute care RN workforce be sufficient to meet acute care workforce demand in Alabama in 2 years (2020)? in 5 years (2023)?

The current acute care RN situation reflects a shortage. However, estimations of future acute care RN entry to the workforce outpace what respondents reported as planned workforce attrition. Future acute care facility demand, however, is less apparent. The small sample size contributing demand data to this study precludes the ability to forecast future demand as a quantitative measurement.

Summary

This study utilized secondary data analysis to describe the acute care RN workforce supply. The original data were collected as part of a voluntary survey administered by the Alabama Board of Nursing during license renewal periods of 2016 and 2018. There were 13,509 RN responses from 2016 and 21,220 RN responses from 2018 that contributed to the study findings characterizing acute care RN supply. Supply demographics including gender, ethnicity, race, and age were reported. Highest level of education, current workforce participation, provider experience, and plans for workforce attrition were also reported. Public data describing patterns of RN workforce entry and RN salary trends were used to supplement study findings.

Acute care RN demand data were collected from CNOs/DONs representing 25 acute care facilities. The *Survey of Acute Care Registered Nurse Employers in Alabama 2019* was used to analyze perceptions of the current labor market, vacancy rates, turnover rates, and expected future employment needs. Although the employer survey response rate was low, state-level aggregation provided a starting point for understanding future workforce demand.

CHAPTER 5

DISCUSSION

Introduction

The purpose of this study was to address the gap in knowledge that exists about the supply and demand of acute care registered nurses (RNs) in the state of Alabama. A cross-sectional exploratory, descriptive research design using a combination of secondary data analysis and primary data collection was employed to expand on what is known. This chapter presents a discussion of the study findings, limitations, and conclusions. Implications of the study findings guide recommendations for future nursing research, actions, and health policy considerations. There is a paucity of literature reporting supply and demand information for acute care RNs at the state level. Therefore, extreme care was taken in linking study findings to the literature, which contributes to the discussion.

Discussion

Aim 1

The purpose of study Aim 1 was to characterize the current supply of acute care hospital RNs in Alabama. Specifically, the research questions were:

RQ 1: How many RNs were licensed and employed in Alabama's acute care hospitals in 2016? In 2018?

RQ 2: What were the demographics (age, ethnicity, race, gender) of RNs licensed and employed in Alabama's acute care hospitals in 2016? in 2018?

The conceptual model used for this study defined the current supply as RN full-time equivalents (FTEs) employed in acute care. The study found that the Alabama estimates of the acute care RN workforce size decreased between 2016 and 2018. Total FTE employment of acute care RNs declined, and there was a shift toward a higher number of part-time employment hours reported in 2018. These findings contradict what is reported elsewhere about the entire RN workforce on a national scale. National-level data have shown a small but steady increase in full-time FTEs contributed by RNs, with a decrease in part-time FTEs (Buerhaus, Auerbach, Friedman, & Staiger, 2014; Smiley et al., 2018). National trends also suggest an increase in the total number of RNs employed in all sectors (Auerbach, Buerhaus, Staiger, 2018). Alabama's acute care full-time and part-time employment percentages are comparable to those found in another recent national study. Stokowski et al. (2017) found that 80% of RNs reported full-time employment, 15% reported part-time employment, and 5% reported per-diem employment.

RN-to-population ratio has been reported in the literature as a measure of RN supply adequacy. Higher numbers of nurses are associated with better population health indices (Bigbee et al., 2014). In 2013, the Health Resources and Services Administration (HRSA) reported that Alabama's RNs per 100,000 population was 960.6. The most recent report from HRSA (2018) indicated that between 2011 and 2015, the RN-to-working-age population ratio per 100,000 in Alabama was 1324.5. It is notable that both of these national-level reports include advanced practice RNs but use different population measurements (i.e., population versus working-age population) as outlined above.

Based upon state-level RN data from this study, the RN-to-population ratios per 100,000 in 2016 and 2018 were 1437.3 and 1541.8, respectively. Although those numbers reflect an increase, RNs serving in advanced practice roles are included. The study found the opposite phenomenon occurring in the acute care RN workforce. The acute care RN-to-population ratio per 100,000 in 2016 was 564.4 and decreased to 531.5 in 2018.

Potential problems with using the RN-to-population ratio as a measurement of supply adequacy include the lack of a recognized benchmark (Bigbee et al., 2014), and the ratio also does not reflect that aging of the population is associated with an increase in demand (Spetz, 2019). Furthermore, the population measure (i.e., population versus working-age population) used impacts data interpretation. For example, a recent report identified that population shifts show Alabama's dependency ratio (population size under age 15 or over 64 compared to the traditional working population ages) is increasing (https://www.census.gov). This population shift has implications not only for acute care RN supply but also demand. In addition to considering the number of acute care RNs, FTE contributions reflecting workforce participation, and RN-to-population ratios, demographics such as ages of working nurses affect nursing supply (Spetz, 2004). The discussion that follows considers acute care RN workforce demographics in detail.

Age

Alabama's acute care RN workforce has an overall larger percentage of younger nurses compared to national-level nursing workforce demographics. In 2016, 69% of the Alabama acute care sample reported being less than 50 years old. This percentage decreased slightly in 2018 to 67%. Comparatively, HRSA's 2018 National Sample

Survey of Registered Nurses (NSSRN) reported that 53% of the nursing workforce is less than 50 years old (HRSA, 2019). The 2017 *National Nursing Workforce Survey* (NNWS) reported that 49% of the workforce is less than age 50 (Smiley et al., 2018). However, considering the workforce characteristic of age in such a dichotomous manner could mask important workforce supply trends.

National-level trends suggest that the employment growth of RNs has been driven by those under age 35 who have been steadily entering the workforce since 2012 (Auerbach et al., 2018b). This national-level pattern was not apparent in the current study. The age groups with the largest number of RNs in 2016 and 2018 were the 30-39 years and 40-49 years groups. In 2016, the third-largest age group was 20-29 years; but in 2018, the 50-59 years age group outpaced growth in the youngest age group. Alabama Board of Nursing's (ABN's) annual licensure reports also show a decreasing number of new nurses licensed through examination entering the Alabama RN workforce between 2015 and 2018. Typically, new licenses issued through examination are attributed to younger workforce members. In addition to workforce inflow and supply concerns, age is also an important demographic to consider related to attrition. Workforce attrition is often due to age-related retirement. Findings from this study related to rates of retirement from acute care are discussed with study Aim 3.

Gender, Ethnicity, and Race

Alabama's acute care workforce continues to reflect an uneven gender distribution. Men represented 11.6% of Alabama's acute care RN workforce in 2016. That percentage decreased to 9.4% in 2018. Recent national-level survey reports vary. Auerbach et al. (2018b) report that men represent 13.7% of the workforce. Other

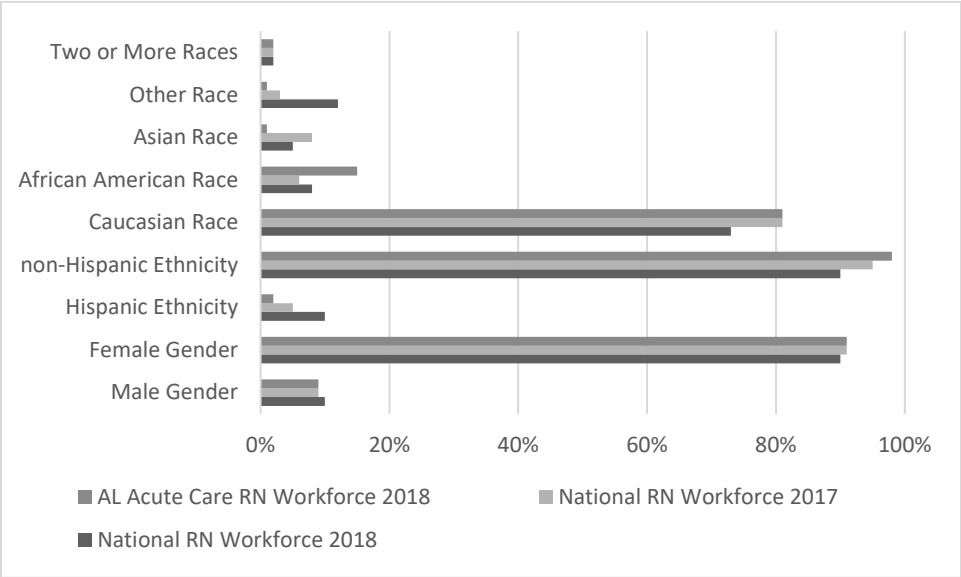
national-level studies report that men represent between 9.1% and 9.6% of the nursing workforce (HRSA, 2019; Smiley et al., 2018).

The racial and ethnic diversity of Alabama's acute care nursing workforce is like that seen in the RN workforce nationally with few exceptions (refer to Figure 11). This study found a higher percentage of African American/Black RNs in Alabama's 2018 acute care workforce (15%) than national-level data sources report (7.8%) (HRSA, 2019). However, a lower percentage of nurses who identify with Asian race or Hispanic ethnicity were found in Alabama.

Figure 12 details a comparison of race and ethnicity data between Alabama's acute care RN workforce and Alabama's resident population. The acute care RN workforce does not reflect the same diversity as the population that it serves. Alabama's state population is 27% African American (U.S. Census Bureau, 2018) and thus exceeds the 15% representation seen in the state's acute care RN workforce. Increasing workforce diversity may prove to be an effective strategy to impact health disparities related to health care access and outcomes. Better interpersonal care in primary and mental health settings has been associated with care received from health professionals of the same ethnicity or race (Gilliss & Powell, 2010). The current lack of diversity in the nursing workforce has been identified by African American and Latinx adolescents as a deterrent to pursuing a nursing career (McGee et al., 2019). Thus, there is a continued need for the acute care RN workforce to reflect greater diversity in order to better match the population it serves.

Figure 11

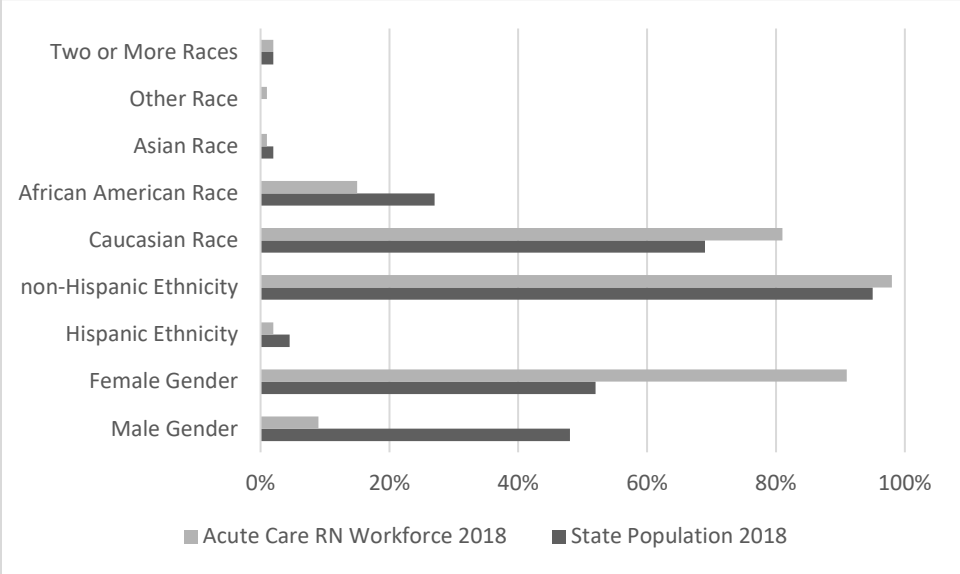
Comparison of State-Level to National-Level Gender, Race, and Ethnicity Workforce Characteristics



Note. Percentages are rounded to the nearest whole number. National RN Workforce 2017 data are derived from the *2017 National Nursing Workforce Survey* (Smiley et al., 2018). National RN Workforce 2018 data are derived from the *2018 National Sample Survey of Registered Nurses Brief Summary of Results* (HRSA, 2019).

Figure 12

Comparison of Alabama's Acute Care Nursing Workforce with Alabama's Population



Note. Alabama population information was retrieved from United States Census Bureau. https://www.census.gov/newsroom/press-kits/2018/pop-estimates-national-state.html

Educational Preparation

Since there are multiple educational pathways to professional nursing practice, data describing nurse educational preparation is a critical component needed to understand the acute care RN workforce. The IOM (2011) recommendations to build a workforce that reflects at least 80% of RNs with a BSN or higher degree have driven the development of innovative educational pathways across the nation. However, Alabama's acute care RN workforce does not reflect this 80% BSN or higher degree goal.

Research has found that higher employment proportions of nurses with a BSN or higher degree are associated with lower hospital mortality (Aiken et al., 2003; Blegen et al., 2013; Estabrooks et al., 2005; Kutney-Lee et al., 2013; Yakusheva et al., 2014),

decreases in hospital length of stay (Blegen et al., 2013; Kutney-Lee & Aiken, 2008), fewer readmissions for patients with pneumonia (McHugh & Ma, 2013), less development of decubitus ulcers (Blegen et al., 2013), lower odds of failure to rescue (Aiken et al., 2003; Blegen et al., 2013), and fewer postoperative complications of deep vein thrombosis and pulmonary embolism (Blegen et al., 2013). Forty-six percent of Alabama's 2016 acute care RN workforce reported their highest educational preparation as BSN or above. There was one percentage point drop in the 2018 sample. Comparatively, the 2018 National Sample Survey of Registered Nurses (NSSRN) (HRSA, 2019) reported that, nationwide, 63.9% of RNs hold a BSN or higher degree, while the 2017 *National Nursing Workforce Survey* (Smiley et al., 2018) reported the percentage as 62.3%. Alabama currently has 26 approved ADN nursing programs and 15 approved BSN programs (ABN, 2020). There were approximately 500 more NCLEX-RN candidates from ADN programs compared to BSN programs in Alabama in 2018 (ABN, 2020). The robust Alabama community college system will continue to produce large numbers of RNs who enter the workforce with preparation via the ADN educational pathway. Alabama has, however, shown an increase in statewide articulation agreements between ADN and BSN programs (AACN, 2019). The articulation agreements, if successfully executed, have the potential to transition Alabama's acute care workforce closer to the 80% BSN goal.

Experience

For this research, experience was measured from the initial year of licensure. Patricia Benner's research (1984), which is based upon the Dreyfus Model of Skill Acquisition and considered seminal research in the nursing profession, advanced the idea

that a nurse's skilled practice develops along a trajectory. That trajectory is driven by time and real-life experience. Thus, nursing experience is often linked to nursing expertise (Hill, 2010). The development of competency occurs with approximately two years of experience, proficiency with around three years of experience, and expertise with around five years of experience (Mullenbach, 2010). Experience is generally recognized as desirable when staffing a high-acuity hospital environment.

The Alabama acute care RN sample reflects a workforce with less experience than what the national-level data suggest is the norm. In the 2018 sample, 41.8% reported being licensed for ≤ 3 years. An additional 15.3% reported licensure durations between 4 and 8 years. Comparatively, the 2017 *National Nursing Workforce Survey* found that nationwide, 32.9% of the RN workforce had been licensed for fewer than 10 years.

The effect of nurse experience on patient outcomes is evident in the literature. For example, research studies have found an inverse relationship between nurse years of experience with medication errors (Blegen et al., 2001), patient falls (Dunton et al., 2007), hospital acquired pressure injury rates (Dunton et al., 2007), and urinary tract infections (Kendall-Gallagher & Blegen, 2009). Researchers have posited that anticipated workforce departures of large numbers of RNs with experience will result in a significant loss of nursing knowledge and expertise, which will affect organizations for many years (Buerhaus et al., 2017). The prospect of many older, more experienced nurses leaving the workforce and taking years of wisdom with them is a concern (Bleich et al., 2006; Faller, 2018). A loss of experience-years (number of nurses multiplied by years of experience) has been developing over the last few years. Buerhaus et al. (2017) estimated that 1.7 million experience-years were lost from the nursing workforce in 2015 alone.

Compensation

Financial compensation for Alabama's acute care RN workforce trails that of other states. The ABN voluntary survey does not collect nurse compensation information. However, the most recent Alabama Occupational Employment Statistics (OES) Report (which reports based on the job classification of RN) records an annual mean RN wage of $60,230 with a mean hourly wage of $28.96 (U.S. Bureau of Labor Statistics, 2019). Alabama's RN salaries are the third lowest in the United States (nurse.org, 2020). The 2017 *National Nursing Workforce Survey* (Smiley et al., 2018) reports similar findings. That study found that full-time RNs in Alabama earn a median wage of $60,000. This low wage, compared to other states in the survey, categorizes Alabama as one of the states with the lowest RN salaries in the country.

Several studies are available that report national-level survey data without specific reference to Alabama RNs. They provide further evidence of the need for accurate state-level data. Stokowski et al. (2017) reported that full-time RNs providing inpatient care have average earnings of $84,000/year or an average hourly wage of $37/hour. The NSSRN (HRSA, 2019) reported findings of a median wage for RNs as $73,929.

Workforce participation is an important measurement that provides indirect insight into the adequacy of compensation for RNs. Logically, when an RN holds more than one position, there is an assumption of the need for additional income. In 2018, 12.6% of Alabama's acute care RNs reported working in two or more employment positions. This reflects a lower percentage than what is reported at the national level (16.7%) by the 2017 *National Nursing Workforce Survey* (Smiley et al., 2018). However, the comparison does not entirely discredit the assumption of additional income need since

the current study samples represent those employed in acute care and the national level data represents the overall RN workforce. Additionally, the acute care RN data demonstrate that older RNs have chosen to stay in the workforce until a later age, as there was an increase in the 60-79 years age range participation of 2.6 percentage points between 2016 and 2018. Delay in retirement suggests the need for continued income.

Aim 2

The purpose of the study Aim 2 was to characterize the current demand for acute care hospital RNs in Alabama. The research questions were:

RQ 1: What was the 2019 demand for RNs practicing in Alabama's acute care hospitals?

RQ 2: What was the 2019 number of RN full-time equivalents (FTEs) budgeted for in Alabama's acute care hospitals?

RQ 3: What was the number of budgeted RN FTEs unfilled in 2019?

RQ 4: In what areas (specialties, units) were Alabama's greatest acute care hospital RN staffing needs in 2019?

The findings from this study contribute to what is known about current acute care RN demand in the state of Alabama. Measuring acute care RN workforce demand is complicated due to the many contributing factors. Inability to access data or collect data on all the contributing factors by the researcher required that the study design be built within the limitations. This study design provided for quantitative data collection, which was believed to be the best way to represent acute care RN demand in a measurable sense. Simply, a workforce shortage would be reflected in a situation where FTE supply < FTE demand. However, during the collection of data for the *Survey of Acute Care*

Registered Nurse Employers in Alabama 2019, respondents shared comments that captured a much richer description of what acute care organizations perceive as their current situation. Discussion of all the findings informing acute care RN demand follow.

Perception of Labor Market

Alabama CNOs/DONs report that the current labor market is one of high demand with difficulty filling open RN positions. Sixty-eight percent of the study sample reported this perception. That percentage increased to 80% when asked specifically about labor demand for experienced RNs. The categorization of high demand with difficulty filling RN positions contradicts the expectation that HRSA (2017) models have produced, which forecast a trajectory toward an RN surplus in Alabama by 2030. Although there is a paucity of data and/or reports produced by other states, nursing shortages elsewhere are known to exist. California's most recent study found that their hospitals continue to find RN demand to be higher than supply, and the lack of experienced nurses characterizes the shortage in that state (Chu & Spetz, 2020).

The top inpatient areas reported by the Alabama CNOs/DONs as having positions that are difficult to fill were medical-surgical, emergency room, and operating room. California reported these same areas in their hospitals are experiencing shortages of experienced nurses (Chu & Spetz, 2020). Bacon and Stewart (2018) conducted a recent national-level survey of perioperative nurses, which identified compensation's impact on nurse shortages in that practice area. Perioperative nurses reported larger wage increases early in a career versus wage increases realized due to experience. The same study reported that retirements were a significant contributor to the shortage, and 73% of their

survey respondents reported a perception that the perioperative nursing shortage has resulted in a "moderate-to-crisis effect on their work environment" (p. 616).

The desire to hire only more experienced nurses may prove to be detrimental. Quinton (2016) reported that health care jobs remain vacant longer than jobs in other industries. Employers want new hires with experience but may not be able to provide wages that attract that experience (Quinton, 2016).

Quantitative Measurements of Demand

A detailed review of the *Survey of Acute Care Registered Nurse Employers in Alabama 2019* responses suggested that data were missing not at random (MNAR) for questions requiring reporting of actual numbers. According to Li and Stuart (2019), when a researcher has data that are MNAR, knowledge of the possible reasons for the missing data must be specified. For this study, two plausible reasons for MNAR data were identified. Because the cost of labor is a significant part of operating costs for an organization, acute care facilities rely on several departments or individuals when managing the cost of the labor workforce. A partial list of those responsible for collecting and understanding the data necessary to complete the questions posed in the survey might include the CNO/DON, individual nursing unit managers, and human resources personnel. The time investment necessary to gather the information from multiple sources within the health care organization may have unintentionally caused a burden on the CNOs/DONs, which translated into a failure to provide the data.

A second possible reason that data were not supplied relates to concerns about organization confidentiality. This study was conducted only after IRB approval with measures to protect the confidentiality of respondents and their associated facilities.

Although survey materials assured personal and facility confidentiality, the data requested may have been interpreted as sensitive information, and thus the respondents chose not to provide the data.

Because of the small sample size and MNAR data, data from the *American Hospital Association Annual Survey FY 2018* were accessed and used for comparison purposes when performing some of the necessary calculations. Utilizing the data from both sources, the estimated deficit between budgeted and filled FTEs in the sample was between 250 and 491.5 FTEs. Since the AHA data did not contribute further understanding of unfilled FTEs, the estimates of unfilled FTEs rely solely on survey responses, which reflected 556 unfilled FTEs. The difference between the measurements interjects uncertainty about the actual number of unfilled FTEs. However, it does not contradict the conclusions that there are unfilled positions, demand is higher than supply, and thus there is a nurse shortage.

Vacancy Rates

Conceptually, the current RN demand for this study is represented by vacancy (FTE) rates and turnover (FTE) rates. Vacancy rates have historically been used as a measure to represent demand. Vacancy rates represent position FTEs. High vacancy rates reflect the inability to fill RN positions (Hisgen et al., 2018). Alabama's vacancy rates are comparable to those reported at hospitals across the nation. A sample calculated vacancy rate of 7.8% and AHA (2018) data calculated vacancy rate of 7.7% demonstrate a remarkable congruency. Because the AHA (2018) reports on data that were supplied to them by the Alabama hospitals, the findings are considered reliable. In comparison, Texas reported in 2019 that the statewide hospital RN position vacancy rate was 5.9%,

and 97 hospitals reported zero vacancies (Texas Center for Nursing Workforce Studies, 2019). According to NSI Nursing Solutions (2020), 62.5% of hospitals across the nation have a vacancy rate higher than 7.5%. In 2019, 31.6% of hospitals across the nation recorded a vacancy rate between 7.5% and 9.9% (NSI, 2020).

Turnover Rates

Turnover rates serve to characterize the movement of persons or separations, whether voluntary or involuntary, that organizations experience. Turnover rates impact vacancy rates. Employee turnover is reflective of fiscal and operational effectiveness (Kurnat-Thoma et al., 2017). Nurses employed less than two years have a turnover rate as high as 35% and can cost the average hospital close to $400,000 for each percentage increase in turnover rates (Becker's Hospital Review, n.d.).

Conceptually, this study planned to report turnover rates as FTE. However, during data analysis, it became apparent that it would be impossible to report turnover FTE rates. The survey data supplied counts of employee separations only. The researcher was unable to identify whether the employees had served the organization in a full-time or part-time capacity. Facility turnover rates identified in this study ranged between 6% and 27%. Although a thorough review of the data reported revealed some questions about response reliability, no other Alabama hospital data references were found that could be used for comparison on this measurement. Texas had a median facility turnover rate by RNs of 18.2% in 2019 (Texas Center for Nursing Workforce Studies, 2019).

In 2019, the national turnover rate for bedside RNs in the Southeast was approximately 17.7%, with those hospitals having fewer than 200 beds demonstrating the highest turnover (NSI, 2020). One respondent to the *Survey of Acute Care Registered*

Nurse Employers in Alabama 2019 recorded "unknown, not tracked" to answer the survey question seeking information about the number of separations. Another respondent recorded the response, "Lots of turnover as they are looking for who is offering the most money." A third respondent shared, "We keep training these nurses who then leave us for a higher pay rate because they market themselves to another employer as experienced." According to NSI (2020), more than 70% of hospitals do not track the associated costs of turnover. This measurement seems especially important to understand due to its impact on nurse demand. The financial and human resource implications of high turnover rates could inform organizations that recruitment and retention strategies are a necessary component of addressing facility nurse demand.

Residency Programs

Nurse residency programs have been promoted as a way to facilitate recruitment, increase retention, and increase new graduate nurse employee satisfaction (Van Camp & Chappy, 2017). This study found that recruiting for staff RNs was reported by 64% as "more difficult than normal." Twenty-four percent of CNOs/DONs ($N = 25$) reported that their organization offers an RN residency program for transition to practice. Documented evidence to support a nurse residency program as an effective recruitment tool was not found in the literature. However, the impact of nurse residencies both on retention and new graduate satisfaction has been studied.

The existing literature evaluating impact of nurse residency programs on retention suggests that the effect is positive but time-limited. Medas et al. (2015) reported an increase in overall new RN retention rates but identified that intent to leave was highest at 12 months. Factors identified as highly correlated with intent to leave were lack of

scheduling flexibility and lack of feedback or recognition from managers. Other studies have also found that a nurse residency program supports increased retention of nurses during the first year of employment, but the impact lessens during the second year of employment (Ackerson & Stiles, 2018; Anderson et al., 2009; Friday et al., 2015; Pillai et al., 2018). Rosenfeld and Glassman (2016) approached their evaluation of a nurse residency program from a long-term perspective based upon 8 cohorts of residents. They found many positive outcomes of their program, but suggested that nurse retention past a 2-year time frame is complex and cannot be attributed to a residency program.

The impact of a nurse residency program on nurse satisfaction is mixed. Significant correlations have been found between higher levels of satisfaction and lower intent to leave (Ulrich et al., 2010). However, nurse residency evaluative studies have found a decrease in nurse satisfaction after 1 year (Anderson et al., 2009), increasing satisfaction scores with time (Fiedler et al., 2014), and no change in satisfaction after nurse residency participation (Goode et al., 2013). Tyndall et al. (2019) posit that as nurse residencies are planned, the shifting types of new graduate nurses must be considered because satisfaction does not appear to moderate turnover intentions as seen with previous generations.

In summary, based upon the current literature, it is impossible to generalize that all nurse residency programs are equal and provide for consistent organizational outcomes. This may be because length and components of these programs vary along with outcome measurements (Pillai et al., 2018). Additionally, the changing workforce demographics may contribute more to what can be known about the impact of nurse residency programs on employer demand. Further research studies are needed.

Educational Preparation

Registered nurses have multiple entry-to-practice educational pathway options. As previously detailed in Chapter 2, multiple studies have supported the benefit to acute care health care organizations of increasing the number of RNs with BSN level or above preparation (Aiken et al., 2003; Blegen et al., 2013; Kutney-Lee & Aiken, 2008; McHugh & Ma, 2013; Yakusheva et al., 2014). In general, Alabama's acute care facilities do not reflect institutional cultures fully committed to the idea of a more highly educated workforce. Only two (8%) of the facilities ($N = 25$) reported that new hire RNs, who have less than a BSN, are required to enroll in a BSN degree-earning program within a specified time frame. Five (20%) offer a pay differential based upon the nursing degree held. However, more than half (52%) of the facilities reported some type of support for RNs enrolled in school for the pursuit of a higher degree. Methods of support include scheduling options (23%), scholarships (31%), and tuition reimbursement (69%).

Findings from this study revealed the challenges organizations face in supporting and investing in educational advancement for their RN workforce. These may contribute to higher turnover rates. One respondent shared that she primarily hires ADN RNs because BSN RNs leave quickly to advance their education for advanced practice roles. In a recent national-level survey of millennial nurses (ages 19-36) by AMN Healthcare (2018), 71% reported plans to pursue a higher degree, 49% reported plans to become an advanced practice nurse, and 28% said they would pursue a nurse practitioner degree with the next 3 years. Those researchers concluded that this generation's keen interest in educational advancement and advanced practice could exacerbate the ever-increasing demand for acute care staff RNs. Similarly, DiMattio and Spegman (2019) found that

baccalaureate-prepared nurses in one hospital system were significantly more likely to leave hospital employment than nurses with less than a baccalaureate degree. These researchers suggested that re-envisioning the role of frontline nurses as a specialty may result in greater retention of baccalaureate-prepared nurses.

The need for hospitals to create a culture where the frontline nurse is recognized, respected, and appreciated has never been more critical than today. Strategies that incorporate professional recognition such as clinical ladder programs and leadership development programs can be used by organizations to provide incentives that support retention (Drenkard & Swartwout, 2005; Moore et al., 2019; Riley et al., 2009). A culture that respects knowledge gained through academic progression is essential, but nurse experience should not be undervalued.

Aim 3

The purpose of study Aim 3 was to estimate future supply and demand for acute care hospital RNs in Alabama.

RQ 1: What is the estimated future supply of RNs licensed and employed in Alabama's acute care hospitals in 2 years (2020)? in 5 years (2023)?

RQ 2: What is the estimated rate of retirement of RNs licensed and employed in Alabama's acute care hospitals in 5 years (2023)? in 10 years (2028)?

RQ 3: What is the estimated future demand for RNs licensed and employed in Alabama's acute care hospitals in 2 years (2020)? in 5 years (2023)?

Future supply for this study was conceptualized as current supply minus predictable separations plus the estimated inflow of new entrants to the workforce. Publicly available data from the ABN annual reports show that the number of licenses

issued annually has reflected declining numbers of licenses issued due to examination. In contrast, licenses issued due to endorsement have increased. It is unclear what percentage of the endorsed licensees enter the workforce as advanced practice nurses, telehealth nurses, and others. However, working within that limitation, the prediction of acute care RN entry is essential to consider.

Acute care RN workforce entry through the fiscal year 2020 suggests a worst-case scenario would add just over 2,000 RNs to the acute care workforce, while the best-case scenario would add 3,262 RNs to the workforce. Predictable separations by 2020 rely upon data collected during the 2016 license renewal cycle. That sample suggested that 9.9% of the acute care workforce anticipated leaving the workforce within 5 years. Based upon previous 2016 acute care RN workforce population estimates, that percentage suggests an anticipated loss of just over 2,700 RNs, or 2,529 FTEs, from the workforce during that same time frame. Under the worst-case scenario, the acute care RN shortage will increase. Under the best-case scenario, the workforce would demonstrate a net gain of nurses by only about 500 RNs. However, because a current nursing shortage state exists, it is unclear whether the additional entrants to the workforce would be sufficient to produce an equilibrium. Alabama's RN license renewal cycle occurs again during the fiscal year 2020, so evaluation of the accuracy of these predictions will serve to inform future state-level data analysis and forecasts.

Likewise, total workforce additions by 2023 reflect a worst-case scenario of adding just under 7,000 RNs to the acute care workforce and a best-case scenario of adding just under 15,000 RNs. Predictable separations from the 2018 supply sample found that 13.3% of respondents reported an intent to leave the workforce by 2023. Based

upon 2018 population estimates, there will be just under 3,500 nurses, or 3,153 FTEs, who plan to leave the acute care workforce by 2023. If the worst-case scenario is the addition of just under 7,000 RNs by 2023, and there is a predicted loss of 3,500 nurses by 2023, this suggests a net 3,500 nurse increase in the acute care RN workforce by 2023. Although it is still unclear exactly how many RNs are currently needed in Alabama to provide equilibrium, the Holt-Winters method, used to forecast the series data points of new entrants to the workforce, provides a workforce forecast that can offer some optimism in growing the acute care RN workforce supply.

This study did not attempt to estimate the supply of nurses 10 years out (2028). However, 27.6% of the 2018 survey participants reported intent to leave the workforce within the next 10 years. Based upon 2018 population estimates, the departure of nurses from the workforce by 2028 will account for 7,170 RNs and 6,543 FTEs. The number would suggest that even with as few as 1,000 new acute care nurses entering the workforce annually, the number of entrants will be sufficient to replace nurses already planning to leave over the next 10 years.

This study conceptualized future demand as projected RN FTE positions, vacancy FTE rates, and turnover FTE rates. Demand data collection for this study proved to be insufficient to provide FTE measurements that could be used to estimate future demand. Respect for the requirements for reliable estimations to inform the future outlook led the researcher to abort attempts at estimating future workforce demand. The study provided evidence of an immediate increased workforce demand, as evidenced by respondent reports of the creation of future positions at their organizations within the next year. However, due to the small sample size and the lack of longitudinal time-series data,

forecasting the magnitude of increased demand past the 1-year time frame would not be statistically sound.

Aim 4

The purpose of study Aim 4 was to forecast whether future acute care hospital RN supply will meet future acute care hospital RN demand in Alabama.

RQ 1: Will Alabama's acute care RN workforce be sufficient to meet acute care workforce demand in Alabama in 2 years (2020)? in 5 years (2023)?

HRSA (2017) forecasts an RN surplus in Alabama by 2030. No other forecast specific to acute care RNs is found in the literature. This study was unable to provide demand forecasting required to meet study Aim 4. The study did find that current acute care RN supply is not sufficient to meet current demand and that CNO/DON immediate plans include the addition of RN positions, which will effectively increase demand. Additionally, study Aim 3 found that acute care RN supply may grow at such a rate to effectively compensate for planned attritions. However, there is insufficient evidence to forecast whether or not future supply will meet future demand.

Limitations

Although this study has served to increase what is known about Alabama's acute care RN workforce supply and demand, there are acknowledged limitations. Characterization of supply using secondary data analysis of voluntary survey data introduced limitations. Recruitment of survey participants and technical decisions made about survey delivery and response capture are two areas that indirectly affected the secondary data analysis. Determining the 2018 sample from the original data set required additional work and time investment by the ABN personnel in support of this research.

The 2018 data did not include the primary place of employment, which was part of the study inclusion criteria. Because of a technology problem associated with the survey delivery, the data failed to capture this element. In response, ABN personnel accessed another secure data source to cross-reference nursing licensure data and identify survey respondents who had a high probability of acute care employment based upon employer names. The process was not without error. However, this was the method agreed upon to address the technological failure of data capture and allow the current study to proceed.

Nonresponse error (when only a portion of the target population responds to the survey) and measurement error due to response bias or submission of false data are both recognized limitations of a survey methodology (Dillman et al., 2014, p. 3). Identifying the study samples, although inclusion/exclusion criteria were believed to be clear, proved to be reliant upon many researcher procedural decisions. For example, the study sample was to exclude nurses credentialed as advanced practice nurses. A single survey question asked the respondents to identify if credentialed as an advanced practice nurse. The survey response options included all types of advanced practice roles, along with an option of "Not credentialed as any of the above," but was delivered as a "select all that apply" question. Several survey respondents selected an advanced practice certification in addition to selecting "Not credentialed as any of the above." The researcher chose to code those responses as "Not credentialed," which could have led to study inclusion/exclusion errors.

The secondary analysis of supply data from 2016 and 2018 found several question/answer delivery changes between each survey delivery. For example, a respondent's age was captured in 2016 as an interval/ratio level variable but recorded as

an age group ordinal level variable in 2018. The intended benefit of characterizing supply utilizing data collected in 2016 and 2018 was to identify potential trends. However, the cross-sectional samples could not be classified as independent of each other. That, combined with selection bias, could contribute to inaccurate identification of trends. Longitudinal data would be much more robust than cross-sectional data in identifying workforce changes.

The advantages of conducting a secondary data analysis included complete survey participant anonymity as well as conservation of researcher resources, specifically time and money, that would have been required for primary data collection. This study received no financial support. Finally, the benefit of working with the ABN as the government agency representing nurses in the state of Alabama cannot be overstated.

Acute care RN demand data also have several limitations. Due to the small number of study respondents and MNAR data, additional data sources had to be identified to inform the study and guide interpretation of the data that were collected. Inaccurate and incomplete data collected could have impacted the conclusions made from the demand analysis. Regional vacancy and turnover rates may have been masked by the data aggregation performed. Letters of support from the ABN and the AHA should have been obtained earlier in the study, along with communication about the study to human resources personnel at hospitals. These actions may have increased response rates.

An additional study limitation was the study timeline. The supply data used are collected on a biennial basis. The timeline for study implementation and completion forced demand data collection to occur several months later than the supply data collection. Several adjustments to the study timeline occurred due to nonresponse from

CNOs/DONs and the necessity to receive several IRB addendum approvals allowing for attempts at participant recruitment through a variety of methods.

Finally, the COVID-19 pandemic considerably impacted the completion of this study and imposed unforeseen data collection limitations. One email received from a CNO exemplifies the situation that contributed to a low employer survey response rate: "We are in a state of emergency throughout Alabama due to the COVID-19 preparation and actions." Letters of support received from the ABN and the AHA created a potential momentum with the study that was unable to be capitalized on due to the pandemic.

Implications for Future Research

The findings from this study support the need for more research that continues to inform workforce supply and demand in Alabama. A research design based on longitudinal data collection would offer the opportunity to follow individual licensees across the years, recording patterns of workforce participation based on age and educational progression. The impact of interventions to retain nurses with experience at the bedside and the impact of attrition from the bedside secondary to increases in advanced practice opportunities must be better understood. Nursing work environment research in Alabama hospitals is needed to further inform retention and job satisfaction.

Since Alabama has recently enacted the Nurse Licensure Compact, it will be essential to study the impact of this licensure change on Alabama nurse supply and demand. Determining whether intent to retire translates into actual retirement would support future workforce planning. Research that identifies which patient outcomes in Alabama are related to acute care RN demographics, supply, and demand is needed.

COVID-19 has created an unprecedented time when understanding acute care RN supply and demand is critical. Studies need to be performed that ascertain the effect of the pandemic on entry into the nursing workforce supply, RN attrition, and changes in workforce participation (i.e., potential reductions in hours worked). As nursing program graduates enter the market with a reduced number of direct patient care experience hours, how will the loss of experience-years from the workforce due to retirements or other separations impact patient outcomes in the short and long term? Due to the paucity of previous acute care RN workforce research in Alabama, the need for future research cannot be overstated.

Implications for Practice, Action, and Policy

Although unable to forecast out several years, this study revealed a current acute care RN shortage in Alabama. Demand is higher than supply. One premise of the current study was that state-level data are necessary because markets are local. To gather, analyze, and report robust state-level data, stakeholder and legislative support is needed. All Alabama citizens rely upon an adequate supply of nursing professionals for the delivery of health care services. State health policy, educational investments, and economic stability require state-level workforce data. Support for the Alabama Board of Nursing Workforce Center enabling ongoing collection of workforce supply and demand data along with other workforce research should be a priority of the state and health care sector.

Millennial nurses are interested in seeking roles as advanced practice nurses. This nursing workforce transition may contribute to gaps in the provision of bedside nursing care (American Hospital Association, 2018). The choice to move from an RN nursing

role to an advanced practice role may be related to higher salaries and the perception of increased professional respect for advanced practice nurses. Recruitment and retention strategies are a pressing need for acute care hospitals in Alabama. Creating an organizational culture that recognizes, respects, and appreciates frontline nurses may contribute to better retention and thus help to ensure an adequate supply of acute care RNs to meet future demand. Adequate compensation of nurse professionals in Alabama should be revisited. As more states, including Alabama, move to the Nurse Licensure Compact, barriers to mobility and expansion of practice opportunities may draw nurses away from Alabama toward higher compensation rates.

Implementation of more nurse residency programs may attract new graduates to choose an Alabama acute care employer even if salary rates are lower than other state compensation rates. Greater attention to nurse work environments must be a priority. As a result of COVID-19, many new graduates will enter the workplace with fewer direct care experience hours. Acute care facilities that provide a culture supporting transition to practice may be an attractive option for these nurses.

Because the long-run labor supply is more elastic than the short-term (Buerhaus, Staiger, Auerbach, 2009), future workforce planning must begin today. Educational programs in Alabama must continue to provide educational pathways that respond to industry needs. Ongoing research is necessary to identify those needs before the corresponding responsive action can be taken.

Recommendations

This study provided insight into the complexity of understanding nurse workforce supply and demand. All Alabama nurses would benefit from receiving education about

the benefits of participating in workforce research as a mechanism to drive positive change for the profession. The best option for understanding workforce supply data, short of a legislative mandate, is a continuation of voluntary data collection performed by the ABN during biennial license renewal periods. Furthermore, because economics courses are not generally part of a nursing education curriculum, providing continuing education to the workforce about basic health care economics principles like supply and demand would empower nurses to support workforce planning.

In addition to continuing with workforce supply data collection, Alabama should invest in an ongoing collection of nursing workforce demand data. A legislative mandate for data collection is recommended due to the economic and human consequences of workforce shortages and surpluses. The *Survey of Acute Care Registered Nurse Employers in Alabama 2019* provided a starting point for the collection of demand data. The tool would benefit from further review and update, as this study identified that some of the questions were prone to multiple interpretations by respondents. Engaging human resources professionals in the collection of the employer demand data should also be a priority in order to obtain the most accurate quantitative demand data. Alabama CNOs/DONs would also benefit from education about the value of evidence-based workforce research and workforce planning.

This study also demonstrated the need for increased communication with stakeholders about the benefits of using nursing research to improve the capacity and quality of health care delivery in Alabama. Nurses serve individuals, families, communities, and society. Providing valid and reliable data to nurse employers enhances their ability to support Alabama's largest health care profession in the provision of high-

quality health care services. Alabama's aging population and high prevalence of chronic diseases suggest that the demand for nursing in Alabama will increase. Preparing to meet those population needs will require workforce planning.

Summary and Conclusions

Alabama is at a critical juncture with important decisions to be made about health care delivery. Nurses are the largest health care professional group in Alabama. A lack of ongoing research to monitor the supply and demand of this workforce is placing Alabama in a precarious position. This study provided evidence of a current acute care nursing shortage in Alabama and a decline in numbers over the last several years of RNs gaining initial licensure through examination. Low compensation, nurses leaving the bedside to pursue advanced practice roles, a decline in the working-age population of Alabama, and anticipation of future workforce loss of experience-years due to retirements are additional factors that contribute to concern about future workforce stability. However, due to limits on the ability to collect employer demand data, this study was unable to provide sufficient evidence that future acute care RN supply will not meet future acute care RN demand. Ongoing research about the supply and demand of the acute care RN workforce should be a legislative and health care sector priority.

References

Ackerson, K., & Stiles, K. A. (2018). Value of nurse residency programs in retaining new graduate nurses and their potential effect on the nursing shortage. *Journal of Continuing Education in Nursing, 49*(6), 282-288. http://doi.org/10.3928/00220124-20180517-09

Aiken, L. H. (1989). The hospital nursing shortage: A paradox of increasing supply and increasing vacancy rates. *Western Journal of Medicine, 151*(1), 87-92.

Aiken, L. H., Cheung, R. B., & Olds, D. M. (2009). Education policy initiatives to address the nurse shortage in the United States. [Web exclusive collection]. *Health Affairs, 28*(3), w646-w656. http://doi.org/10.1377/hlthaff.28.4.w646

Aiken, L. H., Clarke, S. P., Cheung, R. B., Sloane, D. M., & Silber, J. H. (2003). Educational levels of hospital nurses and surgical patient mortality. *Journal of the American Medical Association, 290*, 1617-1623.

Aiken, L. H., Shang, J., Xue, Y., & Sloane, D. M. (2013). Hospital use of agency-employed supplemental nurses and patient mortality and failure to rescue. *Health Services Research, 48*(3), 931-948. http://doi.org/10.1111/1475-6773.12018

Aiken, L. H., Sloane, D., Griffiths, P., Rafferty, A. M., Bryneel, L., McHugh, M., Maier, C. B., Moreno-Casbas, T., Ball, J. E., Ausserhofer, D., & Sermeus, W. (2017). Nursing skill mix in European hospitals: Cross-sectional study of the association with mortality, patient ratings, and quality of care. *BMJ Quality & Safety, 26*(7), 559-568. http://doi.org/10.1136/bmjqs-2016-005567

Alabama Board of Nursing. (2017). *2016 RN renewal demographic data*. http://www.abn.alabama.gov/wp-content/uploads/2017/05/2016_RN_Renewal_Demographics.pdf

Alabama Board of Nursing. (2018). *Daily statistics*. https://www.abn.alabama.gov/

Alabama Board of Nursing. (2020). *Nursing education programs*. *Approved nursing programs.* https://www.abn.alabama.gov/nursing-programs/#tab-lpn

Alabama Department of Labor. (2017). *Workforce development. Labor market information division*. http://www2.labor.alabama.gov/WorkforceDev/Default.aspx#HWOL

Alabama Department of Public Health. (2017). *Alabama Department of Public Health: Comparing Alabama to the U.S. Public health indicators*. http://www.alabamapublichealth.gov/chronicdisease/assets/AlabamaPublicHealthIndicators.pdf

Alabama Health Action Coalition. (2014). *2014 RN workforce snapshot*. http://www.al-hac.org/newsroom

Alabama Health Action Coalition. (2017). *Alabama's registered nurse workforce 2016 demographics.* http://www.abn.alabama.gov/wp-content/uploads/2017/10/2016_RN_Renewal.pdf

Alexander, M. (2018, June). Session 4: National Council of State Boards of Nursing Update. Presented at *The National Forum of State Nursing Workforce Centers 2018 Annual Meeting*. Chicago, IL

Allen, L. (2008). The nursing shortage continues as faculty shortage grows. *Nursing Economic$, 26*(1), 35-40.

American Association of Colleges of Nursing. (2011, December). Talking points: *Health Affairs* article on registered nurse supply. https://www.aacnnursing.org/Portals/42/News/TPNursingShortage.pdf

American Association of Colleges of Nursing. (2017a, May). Fact sheet: Nursing shortage. http://www.aacnnursing.org/Portals/42/News/Factsheets/Nursing-Shortage-Factsheet-2017.pdf

American Association of Colleges of Nursing. (2017b, December). AACN research brief: Employment of new nurse graduates and employer preferences for baccalaureate-prepared nurses. http://www.aacnnursing.org/Portals/42/News/Position-Statements/Research-Brief-12-17.pdf

American Association of Colleges of Nursing. (2019, April). *Articulation agreements among nursing education programs.* https://www.aacnnursing.org/News-Information/Fact-Sheets/Articulation-Agreements

American College of Physicians. (2013). National Health Care Workforce Commission. https://www.acponline.org/system/files/documents/advocacy/where_we_stand/assets/ii4-national-health-care-workforce.pdf

American Hospital Association. (2001, June). The hospital workforce shortage: Immediate and future. *TrendWatch, 3*(2), 1-8. https://www.aha.org/system/files/research/reports/tw/twjune2001.pdf

American Hospital Association. (2018, August). *Younger nurses are increasingly seeking practitioner role*. https://www.aha.org/news/insights-and-analysis/2018-08-22-younger-nurses-are-increasingly-seeking-practitioner-role

AMN Healthcare. (2013). Clinical Workforce Survey. https://www.amnhealthcare.com/uploadedFiles/MainSite/Content/Healthcare_Industry_Insights/Industry_Research/executivesurvey13.pdf

AMN Healthcare. (2018). *Survey of millennial nurses: A dynamic influence on the profession.* https://www.amnhealthcare.com/survey-of-millennial-nurses-2018/

Anderson, T., Linden, L., Allen, M., & Gibbs, E. (2009). New graduate RN work satisfaction after completing an interactive nurse residency. *The Journal of Nursing Administration, 39*(4), 165-169.

Auerbach, D., Buerhaus, P., & Staiger, D. (2018). *Third quarter 2018 data now available* [Research brief]. Center for Interdisciplinary Health Workforce Studies. http://healthworkforcestudies.com/publications-data/third_quarter_2018_data_now_available.html

Auerbach, D. I., Buerhaus, P. I., & Staiger, D. O. (2000). Associate degree graduates and the rapidly aging RN workforce. *Nursing Economic$, 18*(4), 178-184.

Auerbach, D. I., Buerhaus, P. I, and Staiger, D. O. (2007). Better late than never: Workforce supply implication of later entry into nursing. *Health Affairs, 26*(1), 178-185. http://doi.org/10.1377/hlthaff.26.1.178

Auerbach, D. I., Buerhaus, P. I., & Staiger, D. O. (2011). Registered nurse supply grows faster than projected amid surge in new entrants ages 23-26. *Health Affairs, 30*(12), 2286-2292. http://doi.org/10.1377/hlthaff.2011.0588

Auerbach, D. I., Buerhaus, P. I., & Staiger, D. O. (2015a). Do associate degree registered nurses fare differently in the nurse labor market compared to baccalaureate-prepared RNs? *Nursing Economic$, 33*(1), 8-13, 35.

Auerbach, D. I., Buerhaus, P. I., & Staiger, D. O. (2015b). Will the RN workforce weather the retirement of the baby boomers? *Medical Care, 53*(10), 850-856.

Auerbach, D. I., Buerhaus, P. I., & Staiger, D. O. (2017a). How fast will the registered nurse workforce grow through 2030? Projections in nine regions of the country. *Nursing Outlook, 65*(1), 116-122. http://doi.org/10.1016/j.outlook.2016.07.004

Auerbach, D. I., Chattopadhyay, A., Zangaro, G., Staiger, D. O., & Buerhaus, P. I. (2017). Improving nursing workforce forecasts: Comparative analysis of the cohort supply model and the health workforce simulation model. *Nursing Economic$, 35*(6), 283-326.

Auerbach, D. I., Staiger, D. O., Muench, U., & Buerhaus, P. I. (2013). The nursing workforce in an era of health care reform. *New England Journal of Medicine, 368*(16), 1470-1472. http://doi.org/10.1056/NEJMp1301694

Bacon, D. R., & Stewart, K. A. (2018). Results of the 2018 AORN salary and compensation survey. *AORN Journal, 108*(6), 601-619. http://doi.org/10.1002/aorn.12424

Bates, T., Chu, L., & Spetz, J. (2015). Survey of Nurse Employers in California, Fall 2014. https://rnworkforce.ucsf.edu/sites/rnworkforce.ucsf.edu/files/CaliforniaEmployerReport2014v1.1.pdf

Bates, T., Chu, L., & Spetz, J. (2016). Survey of Nurse Employers in California, Fall 2015. https://healthforce.ucsf.edu/sites/healthforce.ucsf.edu/files/publication-pdf/CaliforniaEmployerReport2015_1.1.pdf

Becker's Hospital Review. (n.d.). Infographic: What's the cost of nurse turnover? Retrieved August 1, 2020, from https://www.beckershospitalreview.com/hr/infographic-what-s-the-cost-of-nurse-turnover.html

Benner, P. (1984). *From novice to expert: Excellence and power in clinical nursing practice.* Addison-Wesley.

Bigbee, J. L. (2008). Relationships between nurse- and physician-to-population ratios and state health rankings. *Public Health Nursing, 25*(3), 244-252. http://doi.org/10.1111/j.1525-1446.2008.00701.x

Bigbee, J. L., Evans, S., Lind, B., Perez, S., Jacobo, L., & Geraghty, E. M. (2014). RN-to-population ratio and population health: A multifactorial study. *Journal of Nursing Regulation, 5*(1), 11-17. https://doi.org/10.1016/S2155-8256(15)30094-6

Blegen, M. A., Goode, C. J., Park, S. H., Vaughn, T., & Spetz, J. (2013). Baccalaureate education in nursing and patient outcomes. *Journal of Nursing Administration, 43*(2), 89-94. http://doi.org/10.1097/NNA.0b013e31827f2028

Blegen, M. A., Vaughn, T., & Goode, C. J. (2001). Nurse experience and education: Effect on quality of care. *Journal of Nursing Administration, 31*(1), 33-39.

Blegen, M. A., Vaughn, T., & Vojir, C. P. (2008). Nurse staffing levels: Impact of organizational characteristics and registered nurse supply. *Health Services Research, 43*(1), 154-173. http://doi.org/10.1111/j.1475-6773.2007.00749.x

Bleich, M. R., Connolly, C., Davis, K., Hewlett, P. O., & Hill, K. S. (2006, June). *Wisdom at work: The importance of the older and experienced nurse in the workplace. A white paper.* Robert Wood Johnson Foundation. Retrieved June 27, 2018 from https://www.rwjf.org/en/library/research/2006/06/wisdom-at-work-.html

Bleich, M. R., & Hewlett, P. O. (2004, May). Dissipating the perfect storm: Responses from nursing and the health care industry to protect the public's health. *Online Journal of Issues in Nursing, 9*(2), Manuscript 4. https://ojin.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/Volume92004/No2May04/DissipatingthePerfectStorm.html

Bodenheimer, T., Chen, E. & Bennett, H. D. (2009). Confronting the growing burden of chronic disease: Can the U.S. health care workforce do the job? *Health Affairs, 28*(1), 64-74. http://doi.org/10.1377/hlthaff.28.1.64

Borjas, G. J. (2016). *Labor economics* (7th ed.). McGraw-Hill Education.

Borkowski, N., Amann, R., Song, S., & Weiss, C. (2007). Nurses' intent to leave the profession: Issues related to gender, ethnicity, and educational level. *Health Care Management Review, 32*(2), 160-167. http://doi.org/10.1097/01.HMR.0000267793.47803.41

Brewer, C. S. (2005). Health services research and the nursing workforce: Access and utilization issues. *Nursing Outlook, 53*, 281-290. http://doi.org/10.1016/j.outlook.2005.08.001

Brewer, C. S., Chao, Y., Colder, C. R., Kovner, C. T., & Chacko, T. P. (2015). A structural equation model of turnover for a longitudinal survey among early career registered nurses. *International Journal of Nursing Studies, 52*(11), 1735-1745. http://doi.org/10.1016/j.ijnurstu.2015.06.017

Brink, P. J., & Wood, M. J. (1998a). *Advanced design in nursing research* (2nd ed.). Sage Publications, Inc.

Brink, P. J., & Wood, M. J. (1998b). Descriptive designs. In P. J. Brink & M. J. Wood (Eds.), *Advanced design in nursing research* (2nd ed., pp. 287-307). Sage.

Budden, J. S., Moulton, P., Harper, K. M., Brunell, M. L., & Smiley, M. S. (2016). The 2015 National Nursing Workforce Survey [Supplemental material]. *Journal of Nursing Regulation, 7*(1), S1-S90. http://doi.org/10.1016/S2155-8256(16)31054-7

Budden, J. S., Zhong, E. H., Moulton, P., & Cimiotti, J. P. (2013). Highlights of the National Workforce Survey of Registered Nurses. *Journal of Nursing Regulation, 4*(2), 5-14. https://doi.org/10.1016/S2155-8256(15)30151-4

Buerhaus, P., Auerbach, D. Friedman, C., & Staiger, D. (2014). *Average RN hours continue to increase and part-time RN employment continues to decline* [Research Brief No. 5]. Center for Interdisciplinary Health Workforce Studies. http://healthworkforcestudies.com/news/average-rn-hours-continue-to-increase-and-part-time-rn-employment-continues-to-decline.html

Buerhaus, P. I. (1994). Capitalizing on the recession's effect on hospital RN shortages. *Hospital & Health Services Administration, 39*(1), 1-5.

Buerhaus, P. I. (1998). Is another RN shortage looming? *Nursing Outlook, 46*(3), 103-108. http://doi.org/10.1016/s0029-6554(98)90034-3

Buerhaus, P. I. (2005). Six-part series on the state of the RN workforce in the United States. *Nursing Economic$, 23*(2), 58-60.

Buerhaus, P. I. (2010). What is the harm in imposing mandatory hospital nurse staffing regulations? *Nursing Economic$, 28*(2), 87-93.

Buerhaus, P. I., & Auerbach, D. I. (2011). The recession's effect on hospital registered nurse employment growth. *Nursing Economic$, 29*(4), 163-167.

Buerhaus, P. I., Auerbach, D. I., & Staiger, D. O. (2007). Recent trends in the registered nurse labor market in the U.S.: Short-run swings on top of long-term trends. *Nursing Economic$, 25*(2), 59-57.

Buerhaus, P. I., Auerbach, D. I., & Staiger, D. O. (2009). The recent surge in nurse employment: Causes and implications [Web exclusive collection]. *Health Affairs, 28*(3), w657-w668. http://doi.org/10.1377/hlthaff.28.4.w657

Buerhaus, P. I., Auerbach, D. I., & Staiger, D. O., Muench, U. (2013). Projections of the long-term growth of the registered nurse workforce: A regional analysis. *Nursing Economic$, 31*(1), 13-17.

Buerhaus, P. I., Auerbach, D. I., & Staiger, D. O. (2014). The rapid growth of graduates from associate, baccalaureate, and graduate programs in nursing. *Nursing Economic$, 32*(6), 290-311.

Buerhaus, P. I., Donelan, K., Ulrich, B. T., Norman, L., Williams, M., & Dittus, R. (2005). Hospital RNs' and CNOs' perceptions of the impact of the nursing shortage on the quality of care. *Nursing Economic$, 23*(5), 214-220.

Buerhaus, P. I., Skinner, L. E., Auerbach, D. I., & Staiger, D. O. (2017). Four challenges facing the nursing workforce in the United States. *Journal of Nursing Regulation, 8*(2), 40-46. https://doi.org/10.1016/S2155-8256(17)30097-2

Buerhaus, P. I., & Staiger, D. O. (1999). Trouble in the nurse labor market? Recent trends and future outlook. *Health Affairs, 18*(1), 214-222. https://doi.org/10.1377/hlthaff.18.1.214

Buerhaus, P. I., Staiger, D. O., & Auerbach, D. I. (2000a). Implications of an aging registered nurse workforce. *Journal of the American Medical Association, 283*(22), 2948-2954. http://doi.org/10.1001/jama.283.22.2948

Buerhaus, P. I., Staiger, D. O., & Auerbach, D. I. (2000b). Why are shortages of hospital RNs concentrated in specialty care units? *Nursing Economic$, 18*(3), 111-116.

Buerhaus, P. I., Staiger, D. O., & Auerbach, D. I. (2003). Is the current shortage of hospital nurses ending? *Health Affairs, 22*(6), 191-198. http://doi.org/10.1377/hlthaff.22.6.191

Buerhaus, P. I., Staiger, D. O., & Auerbach, D. I. (2004). New signs of a strengthening U.S. nurse labor market? [Web Exclusive]. *Health Affairs, 23*(1), 526-533. http://doi.org/10.1377/hlthaff.W4.526

Buerhaus, P. I., Staiger, D. O., & Auerbach, D. I. (2009). *The future of the nursing workforce in the United States: Data, trends, and implications*. Jones and Bartlett.

Center for Business and Economic Research. (2018, August). State of the workforce report XII: Alabama. http://www2.labor.alabama.gov/workforcedev/WorkforceReports/Alabama.pdf

Center for the Advancement of Healthcare Professionals. (2015). 2015 survey of registered nurses: Viewpoints on retirement, education, and emerging roles. Retrieved June 27, 2018 from https://www.amnhealthcare.com/2015-RNSurvey/

Chan, M. F., Luk, A. L., Leong, S. M., Yeung, S. M., & Van, I. K. (2008). Factors influencing Macao nurses' intention to leave current employment. *Journal of Clinical Nursing, 18*(6), 893-901. http://doi.org/10.1111/j.1365-2702.2008.02463.x

Chattopadhyay, A., Dall, T., & Armstrong, D. (2016). Introduction to HRSA's web based nursing supply and demand model [Webinar]. In *Health Workforce Technical Assistance Center Series.* http://www.healthworkforceta.org/webinar/introduction-to-hrsas-web-based-nursing-supply-and-demand-model/

Cho, S., Ketefian, S., Barkauska, V. H., & Smith, D. G. (2003). The effects of nurse staffing on adverse events, morbidity, mortality, and medical costs. *Nursing Research, 52*(2), 71-79. http://doi.org/10.1097.00006199-2003030000-00003

Chu, L., & Spetz, J. (2020). Survey of nurse employers in California, Fall/Winter 2018-19. https://rnworkforce.ucsf.edu/sites/rnworkforce.ucsf.edu/files/employerreport_2018.pdf

Chu, L., Spetz, J., & Bates, T. (2018). *Survey of nurse employers in California, Fall 2017*. https://healthforce.ucsf.edu/publications/survey-nurse-employers-california-fall-2017-2018

Cocca-Bates, K. C., & Neal-Boylan, L. (2011). Retired RNs: Perceptions of volunteering. *Geriatric Nursing, 32*(2), 96-105. http://doi.org/10.1016/j.gerinurse.2010.11.003

Coghlan, A. (2018). *A little book of R for time series*. https://buildmedia.readthedocs.org/media/pdf/a-little-book-of-r-for-time-series/latest/a-little-book-of-r-for-time-series.pdf

Cohen, J. D. (2006). The aging nursing workforce: How to retain experienced nurses. *Journal of Healthcare Management, 51*(4), 233-245.

Currie, E. J., & Carr Hill, R. A. (2012). What are the reasons for high turnover in nursing? A discussion of presumed causal factors and remedies. *International Journal of Nursing Studies, 49*(9), 1180-1189. http://doi.org/10.1016/j.ijnurstu.2012.01.001

Devol, R., & Bedroussian, A. (2007). *An unhealthy America: The economic burden of chronic disease—Charting a new course to save lives and increase productivity and economic growth.* Milken Institute.

Dick, T. K. (2020). Supply and demand for Alabama's acute care registered nurse workforce [Unpublished image]. School of Nursing, University of Alabama at Birmingham.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method* (4th ed.). Wiley.

DiMattio, M. J. K., & Spegman, A. M. (2019). Educational preparation and nurse turnover intention from the hospital bedside. *The Online Journal of Issues in Nursing, 24*(2). http://doi.org/10.3912/OJIN.Vol24No02PPT22

Drenkard, K., & Swartwout, E. (2005). Effectiveness of a clinical ladder program. *Journal of Nursing Administration, 35*(11), 502-506. http://doi.org/10.1097/00005110-200511000-00007

Duffield, C., Graham, E., Donoghue, J., Griffiths, R., Bichel-Findlay, J., & Dimitrelis, S. (2014). Why older nurses leave the workforce and the implications of them staying. *Journal of Clinical Nursing, 24*(5-6), 824-831. http://doi.org/10.1111/jocn.12747

Dunton, N., Gajewski, B., Klaus, S., & Pierson, B. (2007). The relationship of nursing workforce characteristics to patient outcomes. *The Online Journal of Issues in Nursing, 12*(3). https://doi.org/10.3912/OJIN.Vol12No03Man03

Duvall, J. J., & Andrews, D. R. (2010). Using a structured review of the literature to identify key factors associated with the current nursing shortage. *Journal of Professional Nursing, 26*(5), 309-317. http://doi.org/10.1016/j.profnurs.2010.02.002

Enoch, E. (2017, December 3). West Alabama nursing shortage mirrors national trend. *Tuscaloosa News.* http://www.tuscaloosanews.com/news/20171203/west-alabama-nursing-shortage-mirrors-national-trend

Estabrooks, C. A., Midodzi, W. K., Cummings, G. G., Ricker, K. L., & Giovannetti, P. (2005). The impact of hospital nursing characteristics on 30-day mortality. *Nursing Research, 54*(2), 74-84. http://doi.org/10.1097/00006199-200503000-00002

Faller, M. (2018). *Retirement surge could drain nursing "wisdom."* Healthcare Workforce Blog. https://www.amnhealthcare.com/retirement-could-drain-nursing-wisdom/

Faller, M., Dent, B., & Gogek, J. (2017). A single-hospital study of travel nurses and quality: What is their impact on the patient experience? *Nurse Leader*, *15*(4), 271-275. http://doi.org/10.1016/j.mnl.2017.03.016

Faller, M., & Gogek, J. (2016). Will the trend toward higher education impact nurse supply? Implications for workforce planning. *Nurse Leader*, *14*(6), 433-437. http://doi.org/10.1016/j.mnl.2016.06.006

Fiedler, R., Read, E. S., Lane, K. A., Hicks, F. D., & Jegier, B. J. (2014). Long-term outcomes of a postbaccalaureate nurse residency program. *The Journal of Nursing Administration, 44*(7/8), 417-422. http://doi.org/10.1097/NNA.0000000000000092

Flinkman, M., Laine, M., Leino-Kilpi, H., Hasselhorn, H. M., & Salantera, S. (2008). Explaining young registered Finnish nurses' intention to leave the profession: A questionnaire survey. *International Journal of Nursing Studies, 45*(5), 727-739. http://doi.org/10.1016/j.ijnurstu.2006.12.006

Florida Center for Nursing. (2012, January). *Demand for nurses in Florida: The 2011 Survey of Florida's Nurse Employers*. Retrieved March 14, 2019 from https://www.flcenterfornursing.org/DigitalLibrary.aspx

Florida Center for Nursing. (2014, January). *Demand for nurses in Florida: The 2013 Survey of Florida's Nurse Employers*. Retrieved March 14, 2019 from https://www.flcenterfornursing.org/DigitalLibrary.aspx

Florida Center for Nursing. (2016, January). *Florida's demand for Nurses: 2015 Employer Survey*. Retrieved March 14, 2019 from https://www.flcenterfornursing.org/DigitalLibrary.aspx

Friday, L., Hollerbach, A. D., Zoller, J. S., Jones, K., & Knofczynski, G. (2015). The effects of a prelicensure extern program and nurse residency program on new graduate outcomes and retention. *Journal for Nurses in Professional Development, 31*(3), 151-157. http://doi.org/10.1097/NND.0000000000000158

Fotsch, R. (2018). States react to advancement of nursing education. *Journal of Nursing Regulation, 9*(2), 60-61.

Gardner, J. K., Thomas-Hawkins, C., Fogg, L., & Latham, C. E. (2007). The relationships between nurses' perceptions of the hemodialysis unit work environment and nurse turnover, patient satisfaction, and hospitalizations. *Nephrology Nursing Journal, 34*(3), 271-281.

Gilliss, C. L., & Powell, D. L. (2010). Recruiting and retaining a diverse workforce in nursing: From evidence to best practices to policy. *Policy, Politics, & Nursing Practice, 11*(4), 294-301. https://doi.org/10.1177/1527154411398491

Goode, C., Pinkerton, S., McCausland, M., Southard, P., Graham, R., & Krsek, C. (2001). Documenting chief nursing officers' preference for BSN-prepared nurses. *Journal of Nursing Administration, 31*(2), 55-59. http://doi.org/10.1097/00005110-200102000-00002

Goode, C. J., Lynn, M. R., McElroy, D., Bednash, G. D., & Murray, B. (2013). Lessons learned from 10 years of research on a post-baccalaureate nurse residency

program. *The Journal of Nursing Administration, 43*(2), 73-79. http://doi.org/10.1097/NNA.0b013e31827f205c

Grumbach, K., Ash, M., Seago, J. A., Spetz, J., & Coffman, J. (2001). Measuring shortages of hospital nurses: How do you know a hospital with a nursing shortage when you see one? *Medical Care Research and Review, 58*(4), 387-403. http://doi.org/10.1177/107755870105800401

Health Resources and Services Administration, National Center for Health Workforce Analysis. (2013, April). *The U.S. nursing workforce: Trends in supply and education*. https://bhw.hrsa.gov/sites/default/files/bhw/nchwa/projections/nursingworkforcetrendsoct2013.pdf

Health Resources and Services Administration, National Center for Health Workforce Analysis. (2014, December). *The future of the nursing workforce: National- and state-level projections, 2012-2025*. https://bhw.hrsa.gov/sites/default/files/bhw/nchwa/projections/nursingprojections.pdf

Health Resources and Services Administration, National Center for Health Workforce Analysis. (2015). Technical documentation for HRSA's Health Workforce Simulation Model. https://bhw.hrsa.gov/sites/default/files/bhw/nchwa/projections/simulationmodeldocumentation.pdf

Health Resources and Services Administration, National Center for Health Workforce Analysis. (2017, July). *Supply and demand projections of the nursing workforce:*

2014-2030. https://bhw.hrsa.gov/sites/default/files/bhw/nchwa/projections/NCHWA_HRSA_Nursing_Report.pdf

Health Resources and Services Administration, National Center for Health Workforce Analysis. (2018). The U.S. health workforce—State profiles: Alabama. https://bhw.hrsa.gov/sites/default/files/bhw/nchwa/state-profiles/alabama-2018.pdf

Health Resources and Services Administration, National Center for Health Workforce Analysis. (2019). *Brief summary results from the 2018 National Sample Survey of Registered Nurses.* https://bhw.hrsa.gov/health-workforce-analysis/data/national-sample-survey-registered-nurses

Hill, K. S. (2010). Improving quality and patient safety by retaining nursing expertise. *The Online Journal of Issues in Nursing, 15*(3). https://doi.org/10.3912/OJIN.Vol15No03PPT03

Hisgen, S. A., Page, N. E., Thornlow, D. K., & Merwin, E. I. (2018). Reducing RN vacancy rate. *The Journal of Nursing Administration, 48*(6), 316-322. http://doi.org/10.1097/NNA.0000000000000621

Holland, P., Tham, T. L., Sheehan, C., & Cooper, B. (2019). The impact of perceived workload on nursing satisfaction with work-life balance and intention to leave the occupation. *Applied Nursing Research, 49*, 70-76. http://doi.org/10.1016/j.apnr.2019.06.001

Institute for Healthcare Improvement. (2019). *IHI Triple Aim Initiative*. http://www.ihi.org/Engage/Initiatives/TripleAim/Pages/default.aspx

Institute of Medicine. (2011). *The future of nursing: Leading change, advancing health*. National Academies Press.

Juraschek, S. P., Zhang, X., Ranganathan, V. K., & Lin, V. W. (2012). United States registered nurse workforce report card and shortage forecast. *American Journal of Medical Quality, 27*(3), 241-249. http://doi.org/10.1177/1062860611416634

Kendall-Gallagher, D., & Blegen, M. A. (2009). Competence and certification of registered nurses and safety of patients in intensive care units. *American Journal of Critical Care, 18*(2), 106-113. http://doi.org/10.4037/ajcc200948

Kimball, B. (2004). Healthcare's human crisis: Rx for an evolving profession. *Online Journal of Issues in Nursing, 9*(2), 90-100. http://ojin.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/Volume92004/No2May04/HealthCaresHumanCrisis.aspx

Kirgan, M., & Golembeski, S. (2010). Retaining an aging workforce by giving voice to older and experienced nurses. *Nurse Leader*, *8*(1), 34-36. https://doi.org/10.1016/j.mnl.2009.11.003

Klaus, S. F., Ekerdt, D. J., & Gajewski, B. (2012). Job satisfaction in birth cohort of nurses. *Journal of Nursing Management, 20*, 461-471. https://doi.org/10.1111/j.1365-2834.2011.01283.x

Kovner, C. T., Brewer, C. S., Fatehi, F., & Jun, J. (2014). What does nurse turnover rate mean and what is the rate? *Policy, Politics, & Nursing, 15*(3-4), 64-71. http://doi.org/10.1177/1527154414547953

Kovner, C. T., Brewer, C. S., Fatehi, F., & Katigbak, C. (2014). Changing trends in newly licensed RNs. *American Journal of Nursing, 114*(2), 26-34. http://doi.org/10.1097/01.NAJ.0000443767.20011.7f

Kovner, C. T., Corcoran, S. P., & Brewer, C. S. (2011). The relative geographic immobility of new registered nurses calls for new strategies to augment that workforce. *Health Affairs, 30*(12), 2293-2300. http://doi.org/10.1377/hlthaff.2011.0108

Kovner, C. T., & Djukic, M. (2009). The nursing career process from application through the first 2 years of employment. *Journal of Professional Nursing, 25*(4), 197-203. http://doi.org/10.1016/j.profnurs.2009.05.002

Kurnat-Thoma, E., Ganger, M., Peterson, K., & Channell, L. (2017). Reducing annual hospital and registered nurse staff turnover—A 10-element onboarding program intervention. *SAGE Open Nursing, 3*, 1-13. http://doi.org/10.1177/2377960817697712

Kutney-Lee, A., & Aiken, L. H. (2008). Effect of nurse staffing and education on the outcomes of surgical patients with comorbid serious mental illness. *Psychiatric Services, 59*(12), 1466-1469. http://doi.org/10.1176/appi.ps.59.12.1466

Kutney-Lee, A., Sloane, D. M., & Aiken, L. H. (2013). An increase in the number of nurses with baccalaureate degrees is linked to lower rates of postsurgery mortality. *Health Affairs, 32*(2), 579-586. http://doi.org/10.1377/hlthaff.2012.0504

Lee, S. D., and Alexander, J. A. (1999). Consequences of organizational change in U.S. hospitals. *Medical Care Research and Review, 56*(3), 227-276. http://doi.org/10.1177/107755879905600301

Leineweber, C., Chungkham, H. S., Lindqvist, R., Westerlund, H., Runesdotter, S., Alenius, L. S., & Tishelman, C. (2016). Nurses' practice environment and satisfaction with schedule flexibility is related to intention to leave due to dissatisfaction: A multi-country, multilevel study. *International Journal of Nursing Studies, 58*, 47-58. http://doi.org/10.1016/j.ijnurstu.2016.02.003

Leroy, M., Laplante, N., Patterson, B., & deRuyter, L. (2014). Perceptions of clinical performance differences: Bachelor of Science in nursing and associate degree in nursing graduates. *Teaching and Learning in Nursing, 9*(4), 171-174. http://doi.org/10.1016/j.teln.2014.06.003

LeVasseur, S. A., Wang, C.-Y., Mathews, B., & Boland, M. (2009). Generational differences in registered nurse turnover. *Policy, Politics, & Nursing Practice, 10*(3), 212-233. http://doi.org/10.1177/1527154409356477

Li, P., & Stuart, E. A. (2019). Best (but oft-forgotten) practices: Missing data methods in randomized controlled nutrition trials. *American Journal of Clinical Nutrition, 109*(3), 504-508. http://doi.org/10.1093/ajcn/nqy271

Liu, Y., Wu, L., Chou, P., Chen, M., Yang, L., & Hsu, H. (2016). The influence of work-related fatigue, work conditions, and personal characteristics on intent to leave among new nurses. *Journal of Nursing Scholarship, 48*(1), 66-73. http://doi.org/10.1111/jnu.12181

Ma, C., Shang, J., & Bott, M. J. (2015). Linking unit collaboration and nursing leadership to nurse outcomes and quality of care. *The Journal of Nursing Administration, 45*(9), 435-442. http://doi.org/10.1097/NNA.0000000000000229

Mankiw, N. G. (2018). *Principles of economics* (8th ed.). Cengage Learning.

McGee, J., Stephenson, E., Teel, C., Moore, W. T., & Peltzer, J. (2019). African American and Latinx adolescents' perspectives on nursing as a career choice. *Journal of Nursing Education, 58*(9), 519-524. https://doi.org/10.3928/01484834-20190819-04

McHugh, M. D., Berez, J., & Small, D. S. (2013). Hospitals with higher nurse staffing had lower odds of readmissions penalties than hospitals with lower staffing. *Health Affairs, 32*(10), 1740-1747. http://doi.org/10.1377/hlthaff.2013.0613

McHugh, M. D., & Ma, C. (2013). Hospital nursing and 30-day readmissions among Medicare patients with heart failure, acute myocardial infarction, and pneumonia. *Medical Care, 51*(1), 52-59. http://doi.org/10.1097/MLR.0b013e3182753284

McHugh, M. D., Rochman, M. F., Sloane, D. M., Berg, R. A., Macini, M. E., Nadkarni, V. M., Merchant, R. M., & Aiken, L. H. (2016). Better nurse staffing and work environments associated with increased survival of in-hospital cardiac arrest patients. *Medical Care, 54* (1), 74-80. http://doi.org/10.1097/MLR.0000000000000456

Medas, J. C., Amato, S., Grimm, D., Radziewicz, R., Rhodes, C., VanHorn, C., & McNett, M. (2015). Outcomes of a comprehensive nurse residency program. *Nursing Management, 46*(11), 40-48. http://doi.org/10.1097/01.NUMA.0000469353.71942

Moore, A., Meucci, J., & McGrath, J. (2019). Attributes of a successful clinical ladder program for nurses: An integrative review. *Worldviews on Evidence-Based Nursing, 16*(4), 263-270. http://doi.org/10.1111/wvn.12076

Moulton, P. L., Wiebusch, P. L., Cleary, B. L., Brunell, M. L., Napier, D. F., Bienemy, C., LeVasseur, S. A., & Cimiotti, J. P. (2012). Toward standardization (part 2): National nursing minimum data set consensus building an implementation status. *Policy, Politics, & Nursing Practice, 13*(3), 162-169. http://doi.org/10.1177/1527154412466920

Mullenbach, K. F. (2010). Senior nursing students' perspectives on the recruitment and retention of medical-surgical nurses. *MEDSURG Nursing, 19*(6), 341-344.

Murphy, G. T., Birch, S., MacKenzie, A., & Rigby, J. (2016). Simulating future supply of and requirements for human resources for health in high-income OECD countries. *Human Resources for Health, 14*, 1-18. http://doi.org/10.1186/s12960-016-0168-x

Murphy, G. T., MacKenzie, A., Alder, R., Birch, S., Kephart, G., & O'Brien-Pallas, L. (2009). An applied simulation model for estimating the supply of and requirements for registered nurses based on population health needs. *Policy, Politics, & Nursing Practice, 10*(4), 240-251. http://doi.org/10.1177/1527154409358777

National Advisory Council on Nurse Education and Practice. (2013). *Achieving health equity through nursing workforce diversity: Eleventh report to the Secretary of the Department of Health and Human Services and the Congress*. https://www.hrsa.gov/advisorycommittees/bhpradvisory/nacnep/Reports/eleventhreport.pdf

National Forum of State Nursing Workforce Centers. (2009). *National nursing workforce minimum datasets*. https://nursingworkforcecenters.org/minimum-datasets/

National Forum of State Nursing Workforce Centers. (2016). *Minimum nurse supply dataset*. https://wbl.742.myftpupload.com/wp-content/uploads/2016/11/National-Forum-Supply-Minimum-Dataset_September-2016.pdf

National League for Nursing. (n.d.). Advocacy and public policy. http://www.nln.org/advocacy-public-policy/legislative-issues/workforce

National League for Nursing. (2013). Annual Survey of Schools of Nursing, Fall 2012. www.nln.org/research/slides/index.htm

National League for Nursing. (2017). Biennial Survey of Schools of Nursing, Academic Year 2015-2016. http://www.nln.org/newsroom/nursing-education-statistics/biennial-survey-of-schools-of-nursing-academic-year-2015-2016

Neal-Boylan, L., Cocca, K., & Carnoali, B. (2009). The benefits to working for retired RNs. *Geriatric Nursing, 30*(6), 378-383. http://doi.org/10.1016/j.gerinurse.2009.07.002

Needleman, J., Buerhaus, P., Mattke, S., Steward, M., & Zelevinsky, K. (2002). Nurse-staffing levels and the quality of care in hospitals. *New England Journal of Medicine, 346*(22), 1715-1722. http://doi.org/10.1056/NEJMsa012247

Nooney, J. G., Cleary, B. L., Moulton, P., Wiebusch, P. L., Murray, J. L., Yore, M., & Brunell, M. L. (2010). Toward standardization (part 1): Assessment of state and national nursing workforce data sources. *Policy, Politics, & Nursing Practice, 11*(3), 173-183. http://doi.org/10.1177/1527154410390521

Nooney, J. G., & Lacey, L. M. (2007). Validating HRSA's nurse supply and demand models: A state-level perspective. *Nursing Economic$, 25*(5), 270-278.

Nooney, J. G., Unruh, L., & Yore, M. M. (2010). Should I stay or should I go? Career change and labor force separation among registered nurses in the U.S. *Social Science & Medicine, 70*(12), 1874-1881. http://doi.org/10.1016/j.socscimed.2010.02.037

NSI Nursing Solutions, Inc. (2020). *2020 NSI national healthcare retention & RN staffing report*. https://www.nsinursingsolutions.com/Documents/Library/NSI_National_Health_Care_Retention_Report.pdf

Nurse.org (2020, April). Highest paying states for registered nurses in 2020. https://nurse.org/articles/highest-paying-states-for-registered-nurses/

O'Brien-Pallas, L., Duffield, C., & Alksnis, C. (2004). Who will be there to nurse? Retention of nurses nearing retirement. *The Journal of Nursing Administration, 34*(6), 298-302. http://doi.org/10.1097/00005110-200406000-00009

Palumbo, M. V., McIntosh, B., Rambur, B., & Naud, S. (2009). Retaining an aging nurse workforce: Perceptions of human resource practices. *Nursing Economic$, 27*(4), 221-232.

Patient Protection and Affordable Care Act, 42 U.S.C. § 18001 et seq. (2010).

Persolja, M. (2018). The effect of nurse staffing patterns on patient satisfaction and needs: A cross-sectional study. *Journal of Nursing Management, 26*(7), 858-865. http://doi.org/10.1111/jonm.12616

Pillai, S., Manister, N., Coppolo, M., Ducey, M., & McManus-Penzero, J. (2018). Evaluation of a nurse residency program. *Journal for Nurses in Professional Development, 34*(6), E23-E28. http://doi.org/10.1097/NND.0000000000000499

Pittman, P., Herrera, C. S., Horton, K., Thompson, P. A., Ware, J. M., & Terry, M. (2013). Healthcare employers' policies on nurse education. *Journal of Healthcare Management, 58*(6), 399-410. http://doi.org/10.1097/00115514-201311000-00005

Polit, D. F., & Beck, C. T. (2017) *Nursing research: Generating and assessing evidence for nursing practice* (10th ed.). Wolters Kluwer.

Quinton, S. (2016, November 16). Why does it take so long to hire a nurse? *Stateline*. https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2016/11/16/why-does-it-take-so-long-to-hire-a-nurse

Ratcliffe, C. J., Cheshire, M. H., Buckner, E. B., Dawson, M. A., Berry, S. R., McDaniel, G. S., & Ladner, K. A. (2017). Building bridges: The journey of Alabama's health action coalition. *Nursing Education Perspectives, 38*(5), 259-263. http://doi.org/10.1097/01.NEP.0000000000000199

Reinier, K., Palumbo, M. V., McIntosh, B., Rambur, B., Kolodinsky, J., Hurowitz, L., & Ashikaga, T. (2005). Measuring the nursing workforce: Clarifying the definitions. *Medical Care Research and Review, 62*(6), 741-755. http://doi.org/10.1177/107755870528107

Reno, K. (2002). How legislation has historically helped nursing when in crisis point. *Nursing Leadership Forum*, *6*(3), 64, 69-71.

Riley, J. K., Rolband, D. H., James, D., & Norton, H. J. (2009). Clinical ladder: Nurses' perceptions and satisfiers. *The Journal of Nursing Administration, 39*(4), 182-188. https://doi.org/10.1097/NNA.0b013e31819c9cc0

Rosenfeld, P. (2007). Workplace practices for retaining older hospital nurses: Implications from a study of nurses with eldercare responsibilities. *Policy, Politics, & Nursing Practice, 8*(2), 120-129. http://doi.org/10.1177/1527154407303497

Rosenfeld, P., & Glassman, K. (2016). The long-term effect of a nurse residency program, 2005-2012. *The Journal of Nursing Administration, 46*(6), 336-344. http://doi.org/10.1097/NNA.0000000000000354

Rumelt, R. P. (2011). *Good strategy bad strategy: The difference and why it matters* [Kindle ebook]. Currency.

Russell, G., Sikdar, S., Imerman, M. D., & Orazem, P. F. (2008). Should I stay or should I go? Nursing license renewal decisions in Iowa. *Nursing Economic$, 26*(6), 361-367, 373.

Russo, G., Fronteira, I., Jesus, T. S., & Buchan, J. (2018). Understanding nurses' dual practice: A scoping review of what we know and what we still need to ask on nurses holding multiple jobs. *Human Resources for Health, 16*, 1-16. https://doi.org/10.1186/s12960-018-0276-x

Santos, S. R., Carroll, C. A., Cox, K. S., Teasley, S. L., Simon, S. D., Bainbridge, L., Cunningham, M., & Ott, L. (2003). Baby boomer nurses bearing the burden of care: A four-site study of stress, strain, and coping for inpatient registered nurses.

The Journal of Nursing Administration, 33(4), 243-250. http://doi.org/10.1097/00005110-200304000-00010

Shader, K., Broome, M. E., Broome, C. D., West, M. E., & Nash, M. (2001). Factors influencing satisfaction and anticipated turnover for nurses in an academic medical center. *The Journal of Nursing Administration, 31*(4), 210-216. http://doi.org/10.1097/00005110-200104000-00010

Shamliyan, T. A., Kane, R. L., Mueller, C., Duval, S., & Witt, T. J. (2009). Cost savings associated with increased RN staffing in acute care hospitals: Simulation exercise. *Nursing Economic$, 27*(5), 302-331.

Skillman, S. M., Palazzo, L., Hart, L. G., & Keepnews, D. (2010). The characteristics of registered nurses whose licenses expire: Why they leave nursing and implications for retention and re-entry. *Nursing Economic$, 28*(3), 181-189.

Sloane, D. M., Smith, H. L., McHugh, M. D., & Aiken, L. H. (2018). Effect of changes in hospital nursing resources on improvements in patient safety and quality of care: A panel study. *Medical Care, 56*(12), 1001-1008. https://doi.org/10.1097/MLR.0000000000001002

Smiley, R. A., Lauer, P., Bienemy, C., Berg, J. G., Shireman, E., Reneau, K. A., & Alexander, M. (2018). The 2017 National Nursing Workforce Survey [Supplemental material]. *Journal of Nursing Regulation, 9*(3), S1- S88. https://doi.org/10.1016/S2155-8256(18)30131-5

Smith, D. B. (2003). The perils of healthcare workforce forecasting: A case study of the Philadelphia metropolitan area. *Journal of Healthcare Management, 48*(2), 99-111. http://doi.org/10.1097/00115514-200303000-00006

Spetz, J. (2004). Hospital nurse wages and staffing, 1977 to 2002: Cycles of shortage and surplus. *The Journal of Nursing Administration, 34*(9), 415-422. http://doi.org/10.1097/00005110-200409000-00007

Spetz, J. (2017). Forecasts of the registered nurse workforce in California. https://www.rn.ca.gov/pdfs/forms/forecast2017.pdf

Spetz, J. (2018). Projections of progress toward the 80% Bachelor of Science in Nursing recommendation and strategies to accelerate change. *Nursing Outlook, 66*(4), 394-400. http://doi.org/10.1016/j.outlook.2018.04.012

Spetz, J. (2019). Forecasts of the registered nurse workforce in California. https://www.rn.ca.gov/pdfs/forms/forecast2019.pdf

Spetz, J. & Given, R. (2003). The future of the nurse shortage: Will wage increases close the gap? *Health Affairs, 22*(6), 199-206. http://doi.org/10.1377/hlthaff.22.6.199

Squires, A., Jylha, V., Jun, J., Ensio, A., Kinnunen, J. (2017). A scoping review of nursing workforce planning and forecasting research. *Journal of Nursing Management, 25*(8), 587-596. http://doi.org/10.1111/jonm.12510

Staiger, D. O., Auerbach, D. I., & Buerhaus, P. I. (2000). Expanding career opportunities for women and the declining interest in nursing as a career. *Nursing Economic$, 18*(5), 230-236.

Stokowski, L. A., Yox, S. B., McBride, M., & Berry, E. (2017, October). Medscape RN/LPN Compensation Report, 2017. https://www.medscape.com/slideshow/2017-rn-lpn-compensation-report-6009118#8

Stone, P. W., Mooney-Kane, C., Larson, E. L., Pastor, D. K., Zwanziger, J., & Dick, A. W. (2007). Nurse working conditions, organizational climate, and intent to leave in ICUs: An instrumental variable approach. *Health Services Research, 42*(3), 1085-1104. http://doi.org/10.1111/j.1475-6773.2006.00651.x

Storey, C., Ford, J., Cheater, F., Hurst, K., & Leese, B. (2007). Nurses working in primary and community care settings in England: Problems and challenges in identifying numbers. *Journal of Nursing Management, 15*(8), 847-852. http://doi.org/10.1111/j.1365-2934.2007.00746.x

Terry, A. J. (2008). Localization of a demand for nursing model at the grassroots level. *Nursing Economic$, 26*(3), 167-173.

Texas Center for Nursing Workforce Studies. (2019, October). *Hospital nurse staffing study*. https://www.dshs.texas.gov/chs/cnws/

Thomas, J. W. (2017). To weight, or not to weight: A primer on survey data weighting. https://www.decisionanalyst.com/blog/dataweighting/

Tyndall, D. E., Scott, E. S., Jones, L. R., & Cook, K. J. (2019). Changing new graduate nurse profiles and retention recommendations for nurse leaders. *The Journal of Nursing Administration, 49*(2), 93-98. http://doi.org/10.1097/NNA.0000000000000716

Ulrich, B., Krozek, C., Early, S., Ashlock, C. H., Africa, L. M., & Carman, M. L. (2010). Improving retention, confidence, and competence of new graduate nurses: Results from a 10-year longitudinal database. *Nursing Economic$, 28*(6), 363-375.

United Health Foundation. (2019). *America's health rankings*. https://www.americashealthrankings.org/explore/annual/measure/Overall/state/AL

U.S. Bureau of Labor Statistics. (n.d.). *Occupational employment statistics.* https://www.bls.gov/oes/home.htm

U.S. Bureau of Labor Statistics. (2017, October). News release: Employment projections 2016-2026. https://www.bls.gov/news.release/pdf/ecopro.pdf

U.S. Bureau of Labor Statistics. (2018, April). *Occupational outlook handbook*. https://www.bls.gov/ooh/healthcare/registered-nurses.htm

U.S. Bureau of Labor Statistics. (2019, May). *Occupational employment and wages.* https://www.bls.gov/oes/current/oes291141.htm

U.S. Census Bureau. (2017). *QuickFacts Alabama*. https://www.census.gov/quickfacts/AL

U.S. Census Bureau. (2018). *2017 national population projections tables*. https://www.census.gov/data/tables/2017/demo/popproj/2017-summary-tables.html

U.S. Census Bureau. (2020). *65 and older population grows rapidly as baby boomers age*. https://www.census.gov/newsroom/press-releases/2020/65-older-population-grows.html

Van Camp, J., & Chappy, S. (2017). The effectiveness of nurse residency programs on retention: A systematic review. *AORN Journal, 106*, 128-144. http://doi.org/10.1016/j.aorn.2017.06.003

Vespa, J., Armstrong, D. M., & Medina, L. (2018, March). *Demographic turning points for the United States: Population projections for 2020 to 2060*. https://www.census.gov/content/dam/Census/library/publications/2018/demo/P25_1144.pdf

Xue, Y., Chappel, A. R., Freund, D. A., Aiken, L. H., & Noyes, K. (2015). Cost outcomes of supplemental nurse staffing in a large medical center. *Journal of Nursing Care Quality, 30*(2), 130-137. http://doi.org/10.1097/NCQ.0000000000000100

Xue, Y., Smith, J., Freund, D. A., & Aiken, L. H. (2012). Supplemental nurses are just as educated, slightly less experienced, and more diverse compared to permanent nurses. *Health Affairs, 31*(11), 2510-2517. http://doi.org/10.1377/hlthaff.2011.1297

Yakusheva, O., Lindrooth, R., & Weiss, M. (2014). Economic evaluation of the 80% baccalaureate nurse workforce recommendation: A patient-level analysis. *Medical Care, 52*(10), 864-869. http://doi.org/10.1097/MLR.0000000000000189

Yoo, B., Lin, T., Kim, M., Saski, T., & Spetz, J. (2016). Effect of prior health-related employment on the registered nurse workforce supply. *Nursing Economic$, 34*(1), 25-34.

Zangaro, G. A., Streeter, R., & Li, T. (2018). Trends in racial and ethnic demographics of the nursing workforce: 2000 to 2015. *Nursing Outlook, 66*(4), 365-371. http://doi.org/10.1016/j.outlook.2018.05.001

Zhang, X., Tai, D., Pforsich, H., & Lin, V. W. (2018). United States registered nurse workforce report card and shortage forecast: A revisit. *American Journal of Medical Quality, 33*(3), 229-236. http://doi.org/10.1177/1062860617738328

Zittel, B. (2018). Passage of New York state legislation mandating academic progression toward the bachelor of science in nursing degree. *Journal of Nursing Regulation, 9*(2), 4-8. http://doi.org/10.1016/S2155-8256(18)30112-1

APPENDIX A

STUDY MAPPING

Table A1

Links to Study Aims and Research Questions

Question	Potential Responses	Level of Measurement	Study Link
Select the facility type that most accurately describes your facility	a. General acute-care hospital/medical center b. Children's hospital c. Other	Nominal	
How would you describe the **overall RN** labor market in your area? (Check only one)	a. High demand; difficult to fill open positions b. Moderate demand; some difficulty filling open positions c. Demand balance with supply d. Demand is less than the RN supply available e. Demand is much less than the RN supply available	Ordinal	Aim 2 (RQ 1)
How would you describe the labor market for **experienced RNs** in your area?	a. High demand; difficult to fill open positions b. Moderate demand; some difficulty filling open positions c. Demand balance with supply d. Demand is less than the RN supply available e. Demand is much less than the RN supply available	Ordinal	Aim 2 (RQ 1)
How would you describe the labor market for **newly-graduated RNs** in your area?	a. High demand; difficult to fill open positions b. Moderate demand; some difficulty filling open positions c. Demand balance with supply d. Demand is less than the RN supply available e. Demand is much less than the RN supply available	Ordinal	Aim 2 (RQ 1)

Which RN positions were difficult to fill in the past year (dates to be filled in here)? Select all that apply.	a. Adult critical care b. Medical, surgical c. Cardiac Cath Lab/Special Services d. Emergency Department e. Case Managers/Discharge Planners f. Labor & Delivery/Postpartum Care g. Oncology h. Operating Room i. Pre or Post Anesthesia Care Unit j. Rehabilitation k. Risk Management/QI/Infection Control l. Telemetry m. Neonatal Critical Care n. Pediatrics o. Pediatric Critical Care p. Unit-level Nurse Managers q. Nurse Administrators r. Other	Nominal	Aim 2 (RQ 4)
How has your employment of **staff RNs** changed in the past year (dates to be filled in here)?	a. Decreased employment b. No change in employment c. Increased employment	Ordinal	Aim 2 (RQ 1)
How has your employment of all other RN positions changed in the last year (dates to be filled in here)?	a. Decreased employment b. No change in employment c. Increased employment	Ordinal	Aim 2 (RQ 1)
Please specify what "other" positions are reported above.	Open field	Nominal	
Which of the following has your facility experienced in the past year (dates	a. RN hiring freeze b. The decrease in use of travel/contract RNs	Nominal	

to be filled in here)? Please select all that apply.	c. Increase in use of travel/contract RNs d. Greater retention of RNs/less turnover e. Less retention of RNs/greater turnover f. Current RNs are working fewer shifts g. Current RNs are working more shifts h. Increase in hospital bed capacity i. The decrease in hospital bed capacity j. More RNs retiring than expected k. Fewer RNs retiring than expected l. Increased patient acuity m. Decreased patient acuity n. Increase in services provided by RNs o. The decrease in services provided by RNs p. Creation of new RN positions q. N/A		
Have you had a shift in your RN hiring in inpatient care in the past year (Dates to be filled in here)?	a. Yes-Increased b. Yes-Decreased c. No-No change	Nominal	Aim 2 (RQ 1)
Have you created new job classifications for RNs in the past year (dates to be filled in here)?	a. Yes b. No	Nominal	Aim 2 (RQ 1)
If yes, please specify any new job classifications for RNs in the past year (dates to be filled in here).	Open field	Nominal	

Have you had a shift in your use of temporary or traveling RNs in inpatient care during the past year (dates to be filled in here)?	a. Yes-Increased b. Yes-Decreased c. No-No change	Nominal	Aim 2 (RQ 1)
What is your experience with recruitment of staff RNs during the last year (dates to be filled in here)?	a. More difficulty recruiting than normal b. About the same difficulty recruiting c. Easier recruiting than normal	Ordinal	Aim 2 (RQ 1)
What is your experience with recruitment of RNs for positions "other" than staff nursing roles during the last year (dates to be filled in here)?	a. More difficulty recruiting than normal b. About the same difficulty recruiting c. Easier recruiting than normal	Ordinal	Aim 2 (RQ 1)
Please specify what "other" positions are reported above.	Open field	Nominal	
What was your total number of RN separations during the last year (dates to be filled in here)?	Open field	Interval/ratio	Aim 2 (RQ 3)
What is your average number of RNs who leave each year?			
What is your current number of full-time permanent RN positions filled on (date to be filled in here)?	Open field	Interval/ratio	Aim 1 (RQ 1) Aim 2 (RQ 2)
What is your current number of unfilled full-time permanent RN positions on (date to be filled in)?	Open field	Interval/ratio	Aim 2 (RQ2) Aim 2 (RQ 3)

What is your current number of unfilled full-time permanent RN positions **that are being actively recruited** on (date to be filled in)?	Open field	Interval/ratio	Aim 2 (RQ 2) Aim 2 (RQ 3)
What is your current number of part-time RN positions filled on (date to be filled in here)?	Open field	Interval/ratio	Aim 1 (RQ 1) Aim 2 (RQ 2)
What is your current number of unfilled part-time RN positions on (date to be filled in)?	Open field	Interval/ratio	Aim 2 (RQ 2) Aim 2 (RQ 3)
What is your current number of unfilled part-time RN positions **that are being actively recruited** on (date to be filled in)?	Open field	Interval/ratio	Aim 2 (RQ 2) Aim 2 (RQ 3)
What is your current total number of per-diem RN hours used in an average week?	Open field	Interval/ratio	Aim 2 (RQ 1)
What is your current number of full-time temporary (agency/travel) RN positions filled?	Open field	Interval/ratio	Aim 2 (RQ 1)
What is your current number of part-time temporary (agency/travel) RN positions filled?	Open field	Interval/ratio	Aim 2 (RQ 1)
What are your expectations for RN employment during the next year compared to during	a. I expect RN employment will be higher in my organization. b. I expect RN employment will not change in my organization	Ordinal	Aim 3 (RQ 3) Aim 4 (RQ 1)

the last year (dates to be filled in here)?	c. I expect RN employment will be lower in my organization.		
If the number of RNs you plan to employ in the next year is different from the number employed during the last year (dates to be filled in here), why do you anticipate a difference?	a. RN hiring freeze b. The decrease in use of travel/contract RNs c. Increase in use of travel/contract RNs d. Greater retention of RNs/less turnover e. Less retention of RNs/greater turnover f. Current RNs are working fewer shifts g. Current RNs are working more shifts h. Increase in hospital bed capacity i. The decrease in hospital bed capacity j. More RNs retiring than expected k. Fewer RNs retiring than expected l. Increased patient acuity m. Decreased patient acuity n. Increase in services provided by RNs o. The decrease in services provided by RNs p. Creation of new RN positions q. N/A	Nominal	Aim 3 (RQ 3) Aim 4 (RQ 1)
How many new full-time RN positions do you plan to add in the next year (dates to be added in here)?	Open field	Interval/ratio	Aim 3 (RQ 3) Aim 4 (RQ 1)
How many new part-time RN positions do you plan to add in the next year (dates to be added in here)?	Open field	Interval/ratio	Aim 3 (RQ 3) Aim 4 (RQ 1)

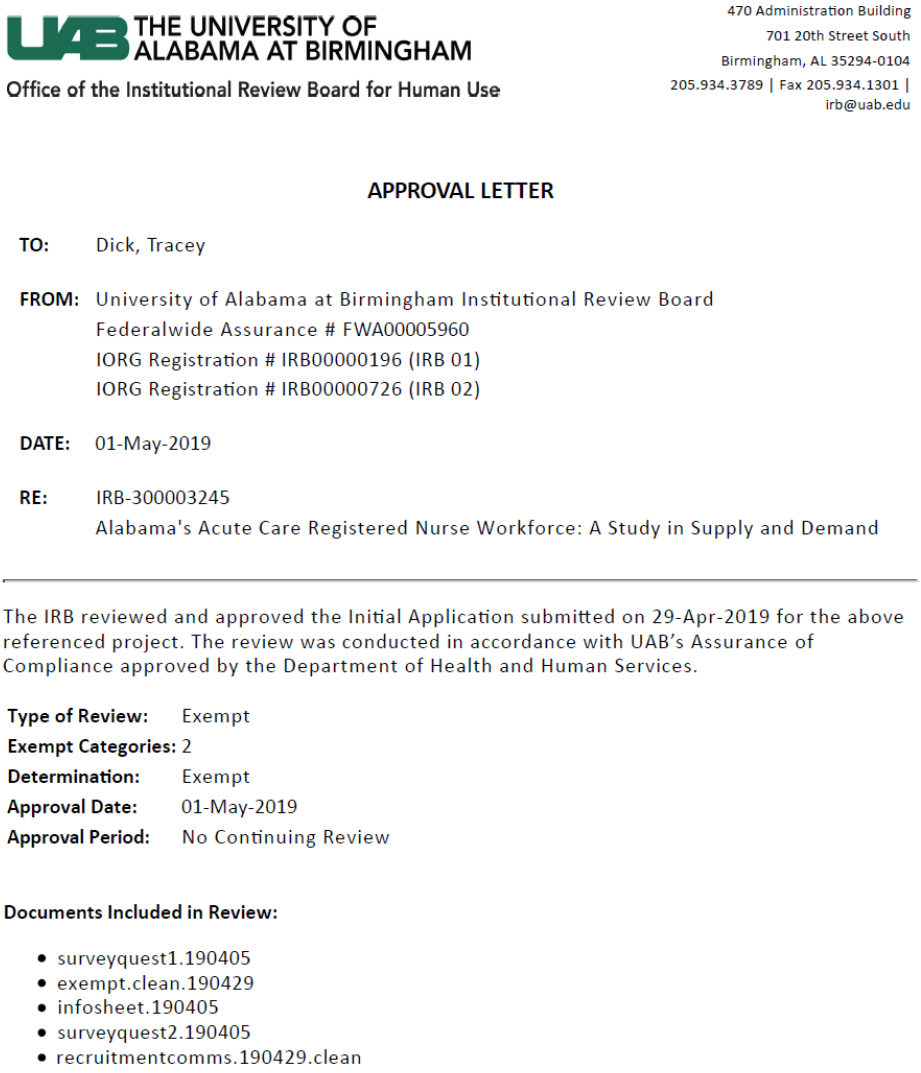
Do you anticipate the creation of new job **classifications** for RNs in the next year (dates to be filled in here)?	a. Yes b. No	Nominal	Aim 3 (RQ 3) Aim 4 (RQ 1)
If yes, please specify any new job classifications for RNs you anticipate creating in the next year (dates to be filled in here).	Open field	Nominal	
Does your organization require new RN hires with an associate or diploma degree to enroll in a BSN program within a specified period?	a. Yes b. No	Nominal	Aim 3 (RQ 3)
Does your organization provide a pay differential for RN salaries based on the type of nursing degree held?	a. Yes b. No	Nominal	
Does your organization provide any type of standard support for RNs who are enrolled in school in pursuit of a higher nursing degree?	a. Yes b. No		
Please specify what type of support is given.	Open field	Nominal	
Does your organization offer an RN residency program for transition to practice?	a. Yes b. No	Nominal	

APPENDIX B

STUDY APPROVAL DOCUMENTS

Figure B1

IRB Approval 2019 Study



THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

Office of the Institutional Review Board for Human Use

470 Administration Building
701 20th Street South
Birmingham, AL 35294-0104
205.934.3789 | Fax 205.934.1301 |
irb@uab.edu

APPROVAL LETTER

TO: Dick, Tracey

FROM: University of Alabama at Birmingham Institutional Review Board
Federalwide Assurance # FWA00005960
IORG Registration # IRB00000196 (IRB 01)
IORG Registration # IRB00000726 (IRB 02)

DATE: 01-May-2019

RE: IRB-300003245
Alabama's Acute Care Registered Nurse Workforce: A Study in Supply and Demand

---

The IRB reviewed and approved the Initial Application submitted on 29-Apr-2019 for the above referenced project. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services.

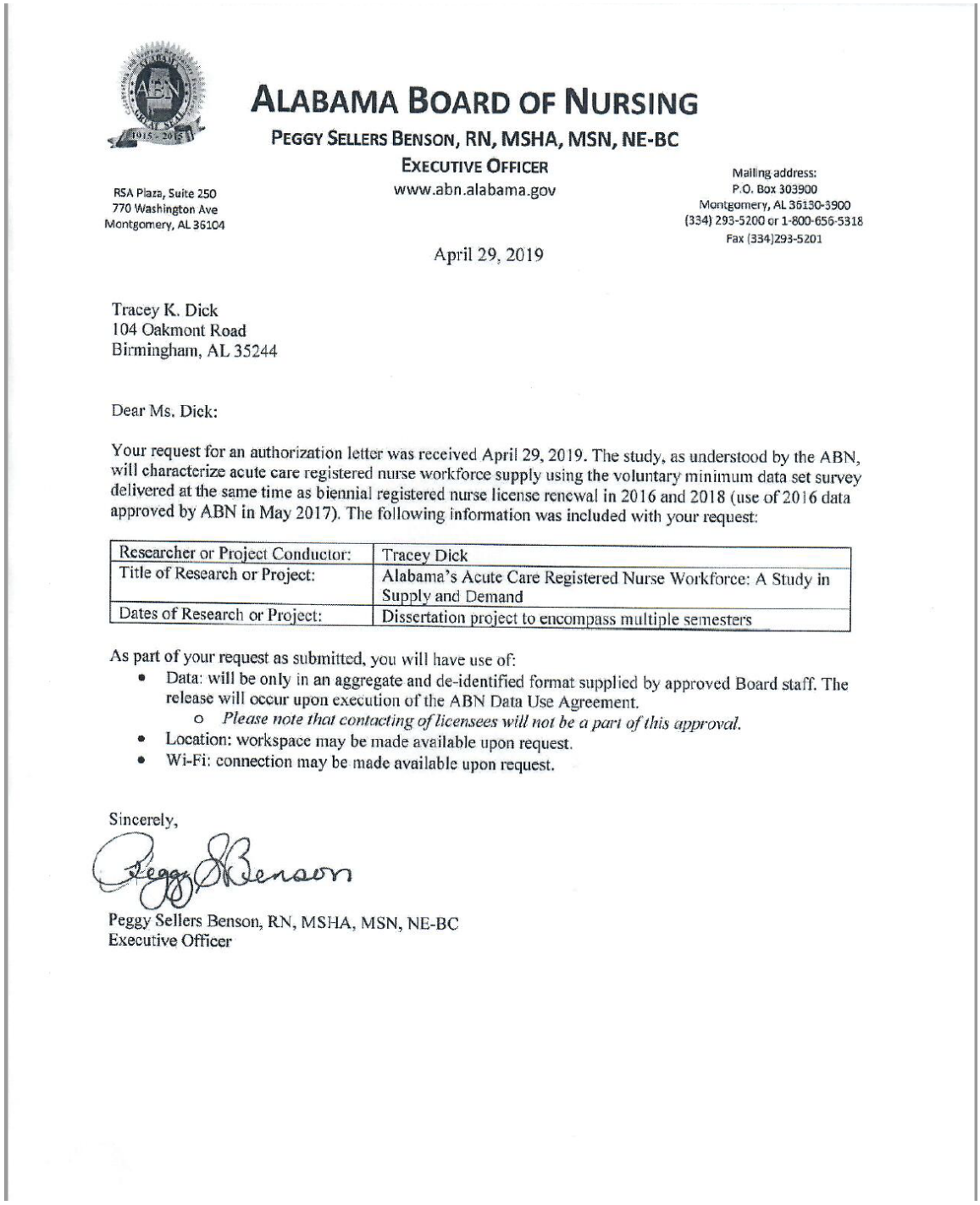
Type of Review: Exempt
Exempt Categories: 2
Determination: Exempt
Approval Date: 01-May-2019
Approval Period: No Continuing Review

Documents Included in Review:

- surveyquest1.190405
- exempt.clean.190429
- infosheet.190405
- surveyquest2.190405
- recruitmentcomms.190429.clean

Figure B2

ABN Approval 2019 Study



ALABAMA BOARD OF NURSING

PEGGY SELLERS BENSON, RN, MSHA, MSN, NE-BC
EXECUTIVE OFFICER
www.abn.alabama.gov

RSA Plaza, Suite 250
770 Washington Ave
Montgomery, AL 36104

Mailing address:
P.O. Box 303900
Montgomery, AL 36130-3900
(334) 293-5200 or 1-800-656-5318
Fax (334)293-5201

April 29, 2019

Tracey K. Dick
104 Oakmont Road
Birmingham, AL 35244

Dear Ms. Dick:

Your request for an authorization letter was received April 29, 2019. The study, as understood by the ABN, will characterize acute care registered nurse workforce supply using the voluntary minimum data set survey delivered at the same time as biennial registered nurse license renewal in 2016 and 2018 (use of 2016 data approved by ABN in May 2017). The following information was included with your request:

Researcher or Project Conductor:	Tracey Dick
Title of Research or Project:	Alabama's Acute Care Registered Nurse Workforce: A Study in Supply and Demand
Dates of Research or Project:	Dissertation project to encompass multiple semesters

As part of your request as submitted, you will have use of:

- Data: will be only in an aggregate and de-identified format supplied by approved Board staff. The release will occur upon execution of the ABN Data Use Agreement.
  - *Please note that contacting of licensees will not be a part of this approval.*
- Location: workspace may be made available upon request.
- Wi-Fi: connection may be made available upon request.

Sincerely,

Peggy Sellers Benson, RN, MSHA, MSN, NE-BC
Executive Officer

Figure B3

IRB Addendum August 2019

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM
Office of the Institutional Review Board for Human Use

470 Administration Building
701 20th Street South
Birmingham, AL 35294-0104
205.934.3789 | Fax 205.934.1301 |
irb@uab.edu

APPROVAL LETTER

TO: Dick, Tracey

FROM: University of Alabama at Birmingham Institutional Review Board
Federalwide Assurance # FWA00005960
IORG Registration # IRB00000196 (IRB 01)
IORG Registration # IRB00000726 (IRB 02)

DATE: 13-Aug-2019

RE: IRB-300003245
Alabama's Acute Care Registered Nurse Workforce: A Study in Supply and Demand

---

The IRB reviewed and approved the Revision/Amendment submitted on 24-Jul-2019 for the above referenced project. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services.

Type of Review: Exempt
Exempt Categories: 2
Determination: Exempt
Approval Date: 13-Aug-2019

Documents Included in Review:

- praf.190723
- phonescript.190723

Figure B4

IRB Addendum November 2019

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM
Office of the Institutional Review Board for Human Use

470 Administration Building
701 20th Street South
Birmingham, AL 35294-0104
205.934.3789 | Fax 205.934.1301 |
irb@uab.edu

APPROVAL LETTER

TO: Dick, Tracey

FROM: University of Alabama at Birmingham Institutional Review Board
Federalwide Assurance # FWA00005960
IORG Registration # IRB00000196 (IRB 01)
IORG Registration # IRB00000726 (IRB 02)

DATE: 30-Nov-2019

RE: IRB-300003245
Alabama's Acute Care Registered Nurse Workforce: A Study in Supply and Demand

---

The IRB reviewed and approved the Revision/Amendment submitted on 13-Nov-2019 for the above referenced project. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services.

Type of Review: Exempt
Exempt Categories: 2
Determination: Exempt
Approval Date: 30-Nov-2019

Documents Included in Review:

- recruitmentcomms.191113
- praf.191113

Figure B5

Letter of Introduction Paper Survey

Date here

Dear Alabama Nurse Leader,

I am contacting you due to your position as a Chief Nursing Officer/Director of Nursing in an Alabama acute care facility. Please find enclosed a brief survey. The purpose of the survey is to determine what employers of acute care registered nurses in Alabama identify as current RN demand and what is anticipated for future RN demand. Employer demand surveys are common in other states. However, little is known about Alabama's current and anticipated future demand for registered nurses.

The survey is part of a larger doctoral dissertation research study entitled **"Alabama's Acute Care Registered Nurse Workforce: A Study in Supply and Demand."** Your responses to the survey questions will be aggregated with responses from other Alabama Chief Nurse Executives to allow for statewide and regional analyses. Findings from this study will be reported in aggregate only. A written report of study outcomes will be sent to all participating CNOs/DONs. A formal presentation will also be available upon request.

All surveys are assigned a unique identifier for the purpose of ensuring confidentiality for you and your organization. If you prefer to ask another individual at your institution to complete the survey, please forward the survey to that person. A postage-paid envelope is included for easy return of the survey.

I am deeply grateful for your help with this research and look forward to receiving your valuable input. If you have any comments or questions about the survey or research protocol at any time, please feel free to contact the principal investigator directly. Contact information is recorded below for your convenience. Additionally, if you have questions about your rights as a research participant, or concerns or complaints about the research, you may contact the UAB Office of the IRB (OIRB) at (205) 934-3789 or toll free at 1-855-860-3789. Regular hours for the OIRB are 8:00 a.m. to 5:00 p.m. CT, Monday through Friday.

Respectfully,

Tracey K. Dick, MSN, RN, CNE, COI
PhD in Nursing Student/ Principal Investigator
The University of Alabama at Birmingham
P: (205) 567-2725
Dissertation Chair: Dr. Patricia Patrician, PhD, RN, FAAN
P: (205) 996-5211

Figure B6

Revised Letter of Introduction March 2020

March 3, 2020

Dear Alabama Nurse Leader,

I am contacting you due to your position as a Chief Nursing Officer/Director of Nursing in an Alabama acute care facility. Please find enclosed a brief survey. The purpose of the survey is to determine what employers of acute care registered nurses in Alabama identify as current RN demand and what is anticipated for future RN demand. Employer demand surveys are common in other states. However, little is known about Alabama's current and anticipated future demand for registered nurses.

The survey is part of a larger doctoral dissertation research study entitled **"Alabama's Acute Care Registered Nurse Workforce: A Study in Supply and Demand."** Your responses to the survey questions will be aggregated with responses from other Alabama Chief Nurse Executives to allow for statewide and regional analyses. Findings from this study will be reported in aggregate only. A written report of study outcomes will be sent to all participating CNOs/DONs. A formal presentation will also be available upon request.

All surveys are assigned a unique identifier for the purpose of ensuring confidentiality for you and your organization. If you prefer to ask another individual at your institution to complete the survey, please forward the survey to that person. A postage-paid envelope is included for easy return of the survey. Alternatively, the survey can be completed online using the following survey link: https://uab.co1.qualtrics.com/jfe/form/SV_cYkbDqLDb1KcCb3

I am deeply grateful for your help with this research and look forward to receiving your valuable input. If you have any comments or questions about the survey or research protocol at any time, please feel free to contact the principal investigator directly. Contact information is recorded below for your convenience. Additionally, if you have questions about your rights as a research participant, or concerns or complaints about the research, you may contact the UAB Office of the IRB (OIRB) at (205) 934-3789 or toll free at 1-855-860-3789. Regular hours for the OIRB are 8:00 a.m. to 5:00 p.m. CT, Monday through Friday.

Respectfully,

Tracey K Dick

Tracey K. Dick, MSN, RN, CNE, COI
PhD in Nursing Student/ Principal Investigator
The University of Alabama at Birmingham
P: (205) 567-2725
Dissertation Chair: Dr. Patricia Patrician, PhD, RN, FAAN
P: (205) 996-5211

Figure B7

IRB Approval 2017 Study

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

Institutional Review Board for Human Use

Exemption Designation
Identification and Certification of Research
Projects Involving Human Subjects

UAB's Institutional Review Boards for Human Use (IRBs) have an approved Federalwide Assurance with the Office for Human Research Protections (OHRP). The Assurance number is FWA00005960 and it expires on November 8, 2021. The UAB IRBs are also in compliance with 21 CFR Parts 50 and 56.

Principal Investigator:	Dick, Tracey
Co-Investigator(s):	Loan, Lori A
Protocol Number:	**E170328007**
Protocol Title:	*Analysis of Alabama Nursing Workforce Data*

The above project was reviewed on 4/14/17. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services. This project qualifies as an exemption as defined in 45CFR46.101(b), paragraph 4.

This project received EXEMPT review.

Date IRB Designation Issued: 4/14/17

Cari Oliver, CIP
Assistant Director, Office of the
Institutional Review Board for Human
Use (IRB)

Investigators please note:

Any modifications in the study methodology, protocol and/or consent form/information sheet must be submitted for review to the IRB prior to implementation.

470 Administration Building
701 20th Street South
205.934.3789
Fax 205.934.1301
irb@uab.edu

The University of
Alabama at Birmingham
Mailing Address:
AB 470
1720 2ND AVE S
BIRMINGHAM AL 35294-0104

Figure B8

ABN Approval 2017 Study

ALABAMA BOARD OF NURSING

PEGGY SELLERS BENSON, RN, MSHA, MSN, NE-BC
EXECUTIVE OFFICER
www.abn.alabama.gov

Institutional Review Committee (IRC)

PART 1: *To be completed by ABN Research Director*			
Date Research/Evidence-Based Project Authorization Letter Request received:	April 17, 2017		
Date of IRC Action on Authorization Letter Request:	Date: May 5, 2017	Approved X	Not Approved
*Comments if Not Approved:			
Date Site Authorization Letter sent by requested method:	Date: May 7, 2017	Method:	Email X Regular Mail
PART 2: *To be completed by ABN Research Director & IRC*			
Date complete IRB packet submitted:	April 17, 2017		
IRB approval from institution:	Present X		Not Present
Research Director: *Mary Ed Davis, DNP, MSN, RN*	Approved X		Not Approved
Signature: Mary Ed Davis		Date: May 8, 2017	
Comments:			
General Counsel: *Alice Henley, JD, LLM*	Approved X		Not Approved
Signature: Alice M. Henley		Date: May 8, 2017	
Comments:			
Executive Officer: *Peggy Benson, RN, MSHA, MSN, NE-BC*	Approved X		Not Approved
Signature: Peggy Benson		Date: May 8, 2017	
Comments:			

Part 1: Research/Evidence-Based Project Authorization Letter Request (Researcher/Project Conductor)
Part 1A: ABN IRC to review request for Authorization Letter (ABN)
Part 2: Complete IRB packet and approval submission to ABN (Researcher/Project Conductor)
Part 2A: ABN IRC for final approval (ABN)

APPENDIX C

EMPLOYER TARGET POPULATION AND STUDY TIMELINE

Table C1

Alabama Acute Care Facilities for Recruitment

Name	Address	City	Zip Code	County
MARSHALL MEDICAL CENTER SOUTH	2505 U S HIGHWAY 431 NORTH	BOAZ	35957	MARSHALL
DEKALB REGIONAL MEDICAL CENTER	200 MED CENTER DRIVE	FORT PAYNE	35968	DE KALB
HALE COUNTY HOSPITAL	508 GREEN STREET	GREENSBORO	36744	HALE
CRESTWOOD MEDICAL CENTER	ONE HOSPITAL DR SE	HUNTSVILLE	35801	MADISON
CHOCTAW GENERAL HOSPITAL	401 VANITY FAIR LANE, PO BOX 618	BUTLER	36904	CHOCTAW
JACK HUGHSTON MEMORIAL HOSPITAL	4401 RIVER CHASE DRIVE	PHENIX CITY	36867	RUSSELL
MARION REGIONAL MEDICAL CENTER	1256 MILITARY STREET SOUTH	HAMILTON	35570	MARION
ANDALUSIA HEALTH	849 SOUTH THREE NOTCH STREET	ANDALUSIA	36420	COVINGTON
COMMUNITY HOSPITAL INC	805 FRIENDSHIP ROAD	TALLASSEE	36078	ELMORE
CALLAHAN EYE HOSPITAL	1720 UNIVERSITY BLVD	BIRMINGHAM	35233	JEFFERSON
CLAY COUNTY HOSPITAL	83825 HIGHWAY 9 P O BOX 1270	ASHLAND	36251	CLAY
ATMORE COMMUNITY HOSPITAL	401 MEDICAL PARK DRIVE	ATMORE	36502	ESCAMBIA
SHELBY BAPTIST MEDICAL CENTER	1000 FIRST STREET NORTH	ALABASTER	35007	SHELBY
WASHINGTON COUNTY HOSPITAL	14600 ST. STEPHENS AVENUE	CHATOM	36518	WASHINGTON
GREENE COUNTY HOSPITAL	509 WILSON AVENUE	EUTAW	35462	GREENE
BULLOCK COUNTY HOSPITAL	102 WEST CONECUH AVENUE	UNION SPRINGS	36089	BULLOCK
ST VINCENTS BLOUNT	150 GILBREATH DRIVE	ONEONTA	35121	BLOUNT
MEDICAL CENTER ENTERPRISE	400 N EDWARDS STREET	ENTERPRISE	36330	COFFEE
UNIVERSITY OF SOUTH ALABAMA MEDICAL CENTER	2451 FILLINGIM STREET	MOBILE	36617	MOBILE
ST VINCENT'S CHILTON	2030 LAY DAM ROAD	CLANTON	35045	CHILTON
MEDICAL CENTER BARBOUR	820 W WASHINGTON ST	EUFAULA	36027	BARBOUR
J PAUL JONES HOSPITAL	317 MCWILLIAMS AVENUE	CAMDEN	36726	WILCOX
BIBB MEDICAL CENTER	208 PIERSON AVE	CENTREVILLE	35042	BIBB
RIVERVIEW REGIONAL MEDICAL CENTER	600 SOUTH THIRD STREET	GADSDEN	35901	ETOWAH
D W MCMILLAN MEMORIAL HOSPITAL	1301 BELLEVILLE AVENUE	BREWTON	36426	ESCAMBIA
GRANDVIEW MEDICAL CENTER	3690 GRANDVIEW PARKWAY	BIRMINGHAM	35243	JEFFERSON
NORTHEAST ALABAMA REGIONAL MEDICAL CENTER	400 EAST 10TH STREET	ANNISTON	36207	CALHOUN
THOMAS HOSPITAL	750 MORPHY AVENUE	FAIRHOPE	36532	BALDWIN
MONROE COUNTY HOSPITAL	2016 SOUTH ALABAMA AVENUE, BOX 886	MONROEVILLE	36460	MONROE
TROY REGIONAL MEDICAL CENTER	1330 HIGHWAY 231 SOUTH	TROY	36081	PIKE
SOUTH BALDWIN REGIONAL MEDICAL CENTER	1613 NORTH MCKENZIE STREET	FOLEY	36535	BALDWIN
FLOWERS HOSPITAL	4370 WEST MAIN STREET	DOTHAN	36305	HOUSTON
EAST ALABAMA MEDICAL CENTER	2000 PEPPERELL PARKWAY	OPELIKA	36801	LEE
SHOALS HOSPITAL	201 WEST AVALON AVENUE	MUSCLE SHOALS	35661	COLBERT

BRYAN W. WHITFIELD MEMORIAL HOSPITAL	105 HIGHWAY 80 EAST	DEMOPOLIS	36732	MARENGO
CHEROKEE MEDICAL CENTER	400 NORTHWOOD DR	CENTRE	35960	CHEROKEE
CHILDREN'S HOSPITAL OF ALABAMA	1600 SEVENTH AVENUE SOUTH	BIRMINGHAM	35233	JEFFERSON
ELMORE COMMUNITY HOSPITAL	500 HOSPITAL DRIVE	WETUMPKA	36092	ELMORE
MEDICAL WEST, AN AFFILIATE OF UAB HEALTH SYSTEM	995 9TH AVENUE SOUTHWEST	BESSEMER	35021	JEFFERSON
ST VINCENT'S BIRMINGHAM	810 ST VINCENT'S DRIVE	BIRMINGHAM	35205	JEFFERSON
HUNTSVILLE HOSPITAL	101 SIVLEY RD	HUNTSVILLE	35801	MADISON
RUSSELLVILLE HOSPITAL	15155 HIGHWAY 43	RUSSELLVILLE	35653	FRANKLIN
NORTHWEST MEDICAL CENTER	1530 U S HIGHWAY 43	WINFIELD	35594	MARION
MOBILE INFIRMARY MEDICAL CENTER	5 MOBILE INFIRMARY CIRCLE	MOBILE	36652	MOBILE
GEORGIANA MEDICAL CENTER	515 N MIRANDA AVENUE	GEORGIANA	36033	BUTLER
EVERGREEN MEDICAL CENTER	101 CRESTVIEW AVENUE	EVERGREEN	36401	CONECUH
SOUTHEAST ALABAMA MEDICAL CENTER	1108 ROSS CLARK CIRCLE	DOTHAN	36301	HOUSTON
BAPTIST MEDICAL CENTER SOUTH	2105 EAST SOUTH BOULEVARD	MONTGOMERY	36116	MONTGOMERY
MIZELL MEMORIAL HOSPITAL	702 N MAIN ST	OPP	36467	COVINGTON
CITIZENS BAPTIST MEDICAL CENTER	604 STONE AVENUE	TALLADEGA	35161	TALLADEGA
UNIVERSITY OF ALABAMA HOSPITAL	619 SOUTH 19TH STREET	BIRMINGHAM	35233	JEFFERSON
HIGHLANDS MEDICAL CENTER	380 WOODS COVE ROAD	SCOTTSBORO	35768	JACKSON
CRENSHAW COMMUNITY HOSPITAL	101 HOSPITAL CIRCLE	LUVERNE	36049	CRENSHAW
RED BAY HOSPITAL	211 HOSPITAL ROAD	RED BAY	35582	FRANKLIN
LAKELAND COMMUNITY HOSPITAL	42024 HIGHWAY 195 E	HALEYVILLE	35565	WINSTON
SPRINGHILL MEMORIAL HOSPITAL	3719 DAUPHIN STREET	MOBILE	36608	MOBILE
L V STABLER MEMORIAL HOSPITAL	29 L V STABLER DRIVE	GREENVILLE	36037	BUTLER
HELEN KELLER MEMORIAL HOSPITAL	1300 SOUTH MONTGOMERY AVENUE	SHEFFIELD	35660	COLBERT
D C H REGIONAL MEDICAL CENTER	809 UNIVERSITY BOULEVARD EAST	TUSCALOOSA	35401	TUSCALOOSA
ELIZA COFFEE MEMORIAL HOSPITAL	205 MARENGO STREET	FLORENCE	35631	LAUDERDALE
STRINGFELLOW MEMORIAL HOSPITAL	301 EAST 18TH ST	ANNISTON	36201	CALHOUN
PICKENS COUNTY MEDICAL CENTER	241 ROBERT K WILSON DRIVE	CARROLLTON	35447	PICKENS
LAKE MARTIN COMMUNITY HOSPITAL	201 MARIARDEN ROAD	DADEVILLE	36853	TALLAPOOSA
BROOKWOOD BAPTIST MEDICAL CENTER	2010 BROOKWOOD MEDICAL CENTER DRIVE	BIRMINGHAM	35209	JEFFERSON
JACKSON MEDICAL CENTER	220 HOSPITAL DRIVE	JACKSON	36545	CLARKE
WIREGRASS MEDICAL CENTER	1200 W MAPLE AVENUE	GENEVA	36340	GENEVA
COOSA VALLEY MEDICAL CENTER	315 W HICKORY ST	SYLACAUGA	35150	TALLADEGA
VAUGHAN REGIONAL MEDICAL CENTER PARKWAY CAMPUS	1015 MEDICAL CENTER PARKWAY	SELMA	36701	DALLAS
DECATUR MORGAN HOSPITAL-DECATUR CAMPUS	1201 7TH STREET SE	DECATUR	35601	MORGAN
PRATTVILLE BAPTIST HOSPITAL	124 S MEMORIAL DR	PRATTVILLE	36067	AUTAUGA
ST VINCENT'S EAST	50 MEDICAL PARK EAST DRIVE	BIRMINGHAM	35235	JEFFERSON
PROVIDENCE HOSPITAL	6801 AIRPORT BOULEVARD	MOBILE	36608	MOBILE
DALE MEDICAL CENTER	126 HOSPITAL AVE	OZARK	36360	DALE
GADSDEN REGIONAL MEDICAL CENTER	1007 GOODYEAR AVENUE	GADSDEN	35903	ETOWAH

FAYETTE MEDICAL CENTER	1653 TEMPLE AVENUE NORTH	FAYETTE	35555	FAYETTE
WALKER BAPTIST MEDICAL CENTER	3400 HIGHWAY 78 EAST	JASPER	35502	WALKER
NORTH BALDWIN INFIRMARY	1815 HAND AVENUE	BAY MINETTE	36507	BALDWIN
TANNER MEDICAL CENTER-EAST ALABAMA	1032 MAIN STREET SOUTH	WEDOWEE	36278	RANDOLPH
LAWRENCE MEDICAL CENTER	202 HOSPITAL STREET	MOULTON	35650	LAWRENCE
ST VINCENT'S ST CLAIR	7063 VETERANS PARKWAY	PELL CITY	35125	SAINT CLAIR
HILL HOSPITAL OF SUMTER COUNTY	751 DERBY DRIVE	YORK	36925	SUMTER
ATHENS LIMESTONE HOSPITAL	700 WEST MARKET STREET	ATHENS	35611	LIMESTONE
UNIVERSITY OF S A CHILDREN'S AND WOMEN'S HOS	1700 CENTER STREET	MOBILE	36604	MOBILE
BAPTIST MEDICAL CENTER EAST	400 TAYLOR ROAD	MONTGOMERY	36117	MONTGOMERY
RUSSELL MEDICAL CENTER	3316 HIGHWAY 280	ALEXANDER CITY	35010	TALLAPOOSA
JACKSON HOSPITAL & CLINIC INC	1725 PINE STREET	MONTGOMERY	36106	MONTGOMERY
PRINCETON BAPTIST MEDICAL CENTER	701 PRINCETON AVENUE SOUTHWEST	BIRMINGHAM	35211	JEFFERSON
CULLMAN REGIONAL MEDICAL CENTER	1912 ALABAMA HIGHWAY 157	CULLMAN	35058	CULLMAN
GROVE HILL MEMORIAL HOSPITAL	295 JACKSON HWY S	GROVE HILL	36451	CLARKE
BIRMINGHAM VETERANS AFFAIRS MEDICAL CENTER	700 SOUTH 19TH STREET	BIRMINGHAM	35233	JEFFERSON
TUSCALOOSA VETERANS AFFAIRS MEDICAL CENTER	3701 LOOP ROAD EAST	TUSCALOOSA	35404	TUSCALOOSA

Table C2

Study Timeline

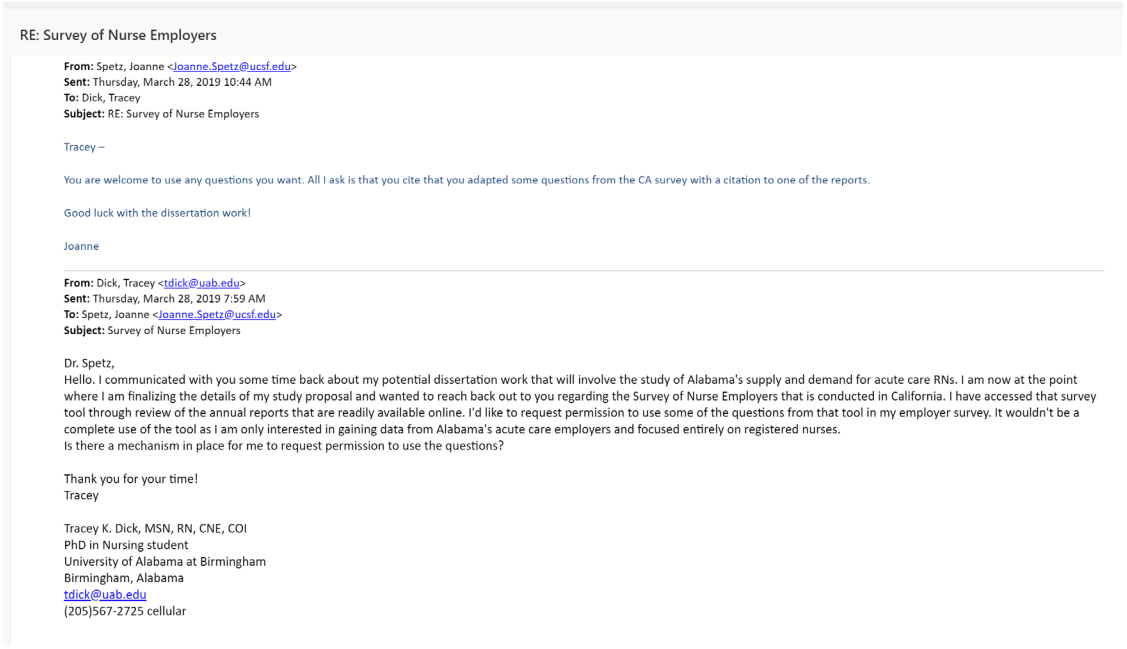
Event	Date
IRB approval for Receipt of 2016 ABN Data	April 2017
ABN approval for Receipt of 2016 ABN Data	May 2017
Receipt of 2016 ABN Data	
ABN approval for Receipt of 2018 ABN Data	April 2019
IRB approval for Receipt of 2018 ABN Data and Collection of Demand Data	May 2019
Receipt of 2018 ABN Data	June 2019
Telephone conference with ABN personnel	
Received ABN subscription data for review	
Updated 2018 ABN Data file received	
Distribution of demand survey via postal and Qualtrics email	July 2019
Follow up reminder from Qualtrics email 1 week after initial survey delivery for non-responders	
Follow up reminder from Qualtrics email 3 weeks after initial survey delivery for non-responders	
Follow up reminder from Qualtrics email 5 weeks after initial survey delivery for non-responders	August 2019
Approval received from IRB for phone calls to acute care facilities to remind potential participants about research in progress	
Follow up phone calls made	
Follow up reminder from Qualtrics email 10 weeks after initial survey delivery for non-responders	September 2019
Electronic survey access closed	
Approval received from IRB for recruitment addendum allowing direct meetings with CNOs	November 2019
Face-to-face appointments with Alabama CNOs to explain/present research	December 2019
Dissertation Committee Meeting Update on status of data collected	February 2020
Received letter of dissertation research support from ABN Executive Director	March 2020
Letter was used in final research invitation mailing to target hospitals	
Received email of dissertation research support from a representative of Alabama Hospital Association	
Information about study was sent via email listserve to AlaHA human resources contacts	
Mailed research invitation packet to final target hospital list of non-respondents that had > 100 beds (n = 30 hospitals)	
Phone calls to each hospital that would receive packet	
COVID-19 pandemic	
Received approval from committee to move forward with data analysis	April 2020
Began Demand Survey Data Analysis	

APPENDIX D

LETTERS OF SUPPORT

Figure D1

Approval for Use of Survey Questions



RE: Survey of Nurse Employers

From: Spetz, Joanne <Joanne.Spetz@ucsf.edu>
Sent: Thursday, March 28, 2019 10:44 AM
To: Dick, Tracey
Subject: RE: Survey of Nurse Employers

Tracey –

You are welcome to use any questions you want. All I ask is that you cite that you adapted some questions from the CA survey with a citation to one of the reports.

Good luck with the dissertation work!

Joanne

From: Dick, Tracey <tdick@uab.edu>
Sent: Thursday, March 28, 2019 7:59 AM
To: Spetz, Joanne <Joanne.Spetz@ucsf.edu>
Subject: Survey of Nurse Employers

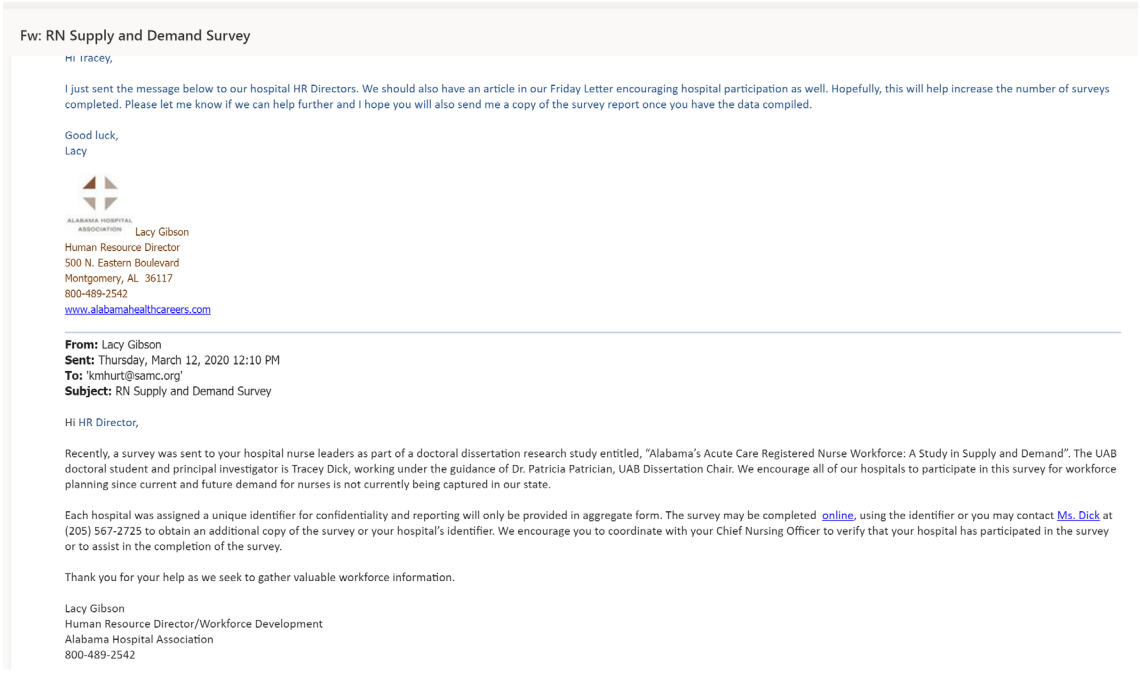
Dr. Spetz,
Hello. I communicated with you some time back about my potential dissertation work that will involve the study of Alabama's supply and demand for acute care RNs. I am now at the point where I am finalizing the details of my study proposal and wanted to reach back out to you regarding the Survey of Nurse Employers that is conducted in California. I have accessed that survey tool through review of the annual reports that are readily available online. I'd like to request permission to use some of the questions from that tool in my employer survey. It wouldn't be a complete use of the tool as I am only interested in gaining data from Alabama's acute care employers and focused entirely on registered nurses.
Is there a mechanism in place for me to request permission to use the questions?

Thank you for your time!
Tracey

Tracey K. Dick, MSN, RN, CNE, COI
PhD in Nursing student
University of Alabama at Birmingham
Birmingham, Alabama
tdick@uab.edu
(205)567-2725 cellular

Figure D2

Letter of Support from Alabama Hospital Association



Fw: RN Supply and Demand Survey

Hi Tracey,

I just sent the message below to our hospital HR Directors. We should also have an article in our Friday Letter encouraging hospital participation as well. Hopefully, this will help increase the number of surveys completed. Please let me know if we can help further and I hope you will also send me a copy of the survey report once you have the data compiled.

Good luck,
Lacy

ALABAMA HOSPITAL ASSOCIATION

Lacy Gibson
Human Resource Director
500 N. Eastern Boulevard
Montgomery, AL 36117
800-489-2542
www.alabamahealthcareers.com

From: Lacy Gibson
Sent: Thursday, March 12, 2020 12:10 PM
To: 'kmhurt@samc.org'
Subject: RN Supply and Demand Survey

Hi HR Director,

Recently, a survey was sent to your hospital nurse leaders as part of a doctoral dissertation research study entitled, "Alabama's Acute Care Registered Nurse Workforce: A Study in Supply and Demand". The UAB doctoral student and principal investigator is Tracey Dick, working under the guidance of Dr. Patricia Patrician, UAB Dissertation Chair. We encourage all of our hospitals to participate in this survey for workforce planning since current and future demand for nurses is not currently being captured in our state.

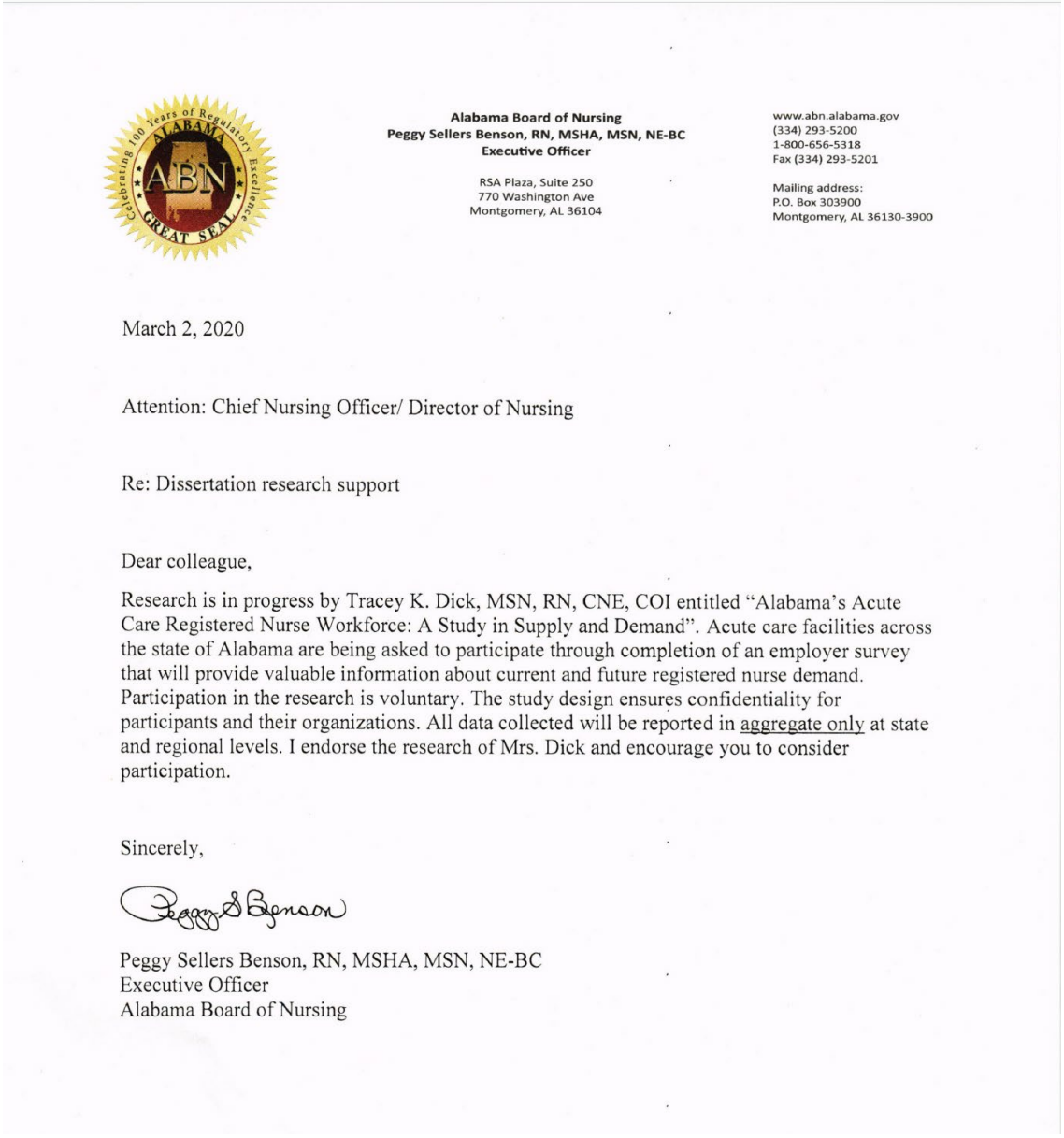
Each hospital was assigned a unique identifier for confidentiality and reporting will only be provided in aggregate form. The survey may be completed online, using the identifier or you may contact Ms. Dick at (205) 567-2725 to obtain an additional copy of the survey or your hospital's identifier. We encourage you to coordinate with your Chief Nursing Officer to verify that your hospital has participated in the survey or to assist in the completion of the survey.

Thank you for your help as we seek to gather valuable workforce information.

Lacy Gibson
Human Resource Director/Workforce Development
Alabama Hospital Association
800-489-2542

Figure D3

Letter of Support from Alabama Board of Nursing



Alabama Board of Nursing
Peggy Sellers Benson, RN, MSHA, MSN, NE-BC
Executive Officer

RSA Plaza, Suite 250
770 Washington Ave
Montgomery, AL 36104

www.abn.alabama.gov
(334) 293-5200
1-800-656-5318
Fax (334) 293-5201

Mailing address:
P.O. Box 303900
Montgomery, AL 36130-3900

March 2, 2020

Attention: Chief Nursing Officer/ Director of Nursing

Re: Dissertation research support

Dear colleague,

Research is in progress by Tracey K. Dick, MSN, RN, CNE, COI entitled "Alabama's Acute Care Registered Nurse Workforce: A Study in Supply and Demand". Acute care facilities across the state of Alabama are being asked to participate through completion of an employer survey that will provide valuable information about current and future registered nurse demand. Participation in the research is voluntary. The study design ensures confidentiality for participants and their organizations. All data collected will be reported in aggregate only at state and regional levels. I endorse the research of Mrs. Dick and encourage you to consider participation.

Sincerely,

Peggy Sellers Benson, RN, MSHA, MSN, NE-BC
Executive Officer
Alabama Board of Nursing