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United States Nursing Homes and Health Equity During the COVID-19 Pandemic

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UNITED STATES NURSING HOMES AND HEALTH EQUITY DURING THE COVID-19

PANDEMIC

by

CARLA RENEE' COOPER

(Under the Direction of Samuel Opoku)

ABSTRACT

Objective: The COVID-19 pandemic disproportionately affected older populations, with nursing homes impacted early on by the disease. The contribution of race/ethnicity of nursing home residents and facility characteristics on COVID-19 were unknown. The Donabedian model framework was used to study the relationship between the racial/ethnic characteristics of nursing home residents and COVID-19 outcomes and to examine if this relationship was moderated by the racial/ethnic composition of the county of nursing home location. Method: Cross-sectional research design merging data from five publicly available sources. Laboratory confirmed COVID-19 cases and deaths were compared by the racial composition of the county and nursing home. Firth logistic regression model and two zero-inflated negative binomial regression models were run to address the study aims. Statistical significance was assessed at $p<.05$, and all analyses were conducted in STATA version 16. Results: 14,405 nursing homes examined this study. These facilities reported a mean confirmed COVID-19 cases and deaths of 45 and 8, respectively. The interaction of nursing home location and resident racial composition was associated with the number of nursing home COVID-19 deaths. Conclusion: Location characteristics of nursing homes in conjunction with a predominantly minority nursing home resident population did not play a role in the number of COVID-19 cases but did impact COVID-19 deaths. Standardized safety measures implemented in nursing homes seemed to help minimize differences in COVID-19 cases between nursing facilities. Historical health inequality for minority populations and social determinants of health are factors that could have increased the number of deaths for minority residents.

INDEX WORDS: COVID-19, Nursing home, Ventilator dependent unit, Health equity, Social determinants of health

UNITED STATES NURSING HOMES & HEALTH EQUITY DURING THE COVID-19 PANDEMIC

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DOCTOR OF PUBLIC HEALTH

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UNITED STATES NURSING HOMES & HEALTH EQUITY DURING THE COVID-19 PANDEMIC

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DEDICATION

This dissertation study is dedicated to the researchers, heroes, survivors of COVID-19, and the memory of

the friends and family lost due to the COVID-19 pandemic.

ACKNOWLEDGMENTS

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CHAPTER 1

BACKGROUND

Introduction

The novel coronavirus 2019 (COVID-19) pandemic is a severe public health emergency of international importance and the first pandemic in over a century affecting more than 100 countries (Kannan, 2020; Nair et al., 2020). It started in Wuhan, China, in December 2019 and was declared a pandemic by the World Health Organization (WHO) in March 2020. By April 2020, almost 250 countries were affected (Afifi, 2020; Louis-Jean et al., 2020; Nair et al., 2020).

The early response efforts focused on individual-level biological susceptibility to the virus, such as age and pre-existing health conditions (Afifi, 2020). The focus on biological risk factors resulted in an omission of the social factors that could exacerbate disease risk through the life course for some populations (Afifi, 2020). Minorities' health disparities were highlighted by COVID-19 health outcomes, especially with Blacks disproportionately dying at a greater rate than the national average (Louis-Jean et al., 2020). The observed disparities in infections and deaths across sub-population groups indicate that the response efforts did not incorporate the principles of public health targeted at improving the health of people and communities with equity, fairness, and inclusiveness (Afifi, 2020).

COVID-19 exposed existing societal biases and inequalities in the United States, producing challenges with containing the virus and decreasing morbidity and mortality in vulnerable populations (Farley et al., 2020; Sharifi & Khavarian-Garmsir, 2020). Those in nursing homes and minorities were members of this vulnerable population, creating devastation due to increased exposure, rapid transmission, multiple COVID-19 cases, and deaths. Many factors magnified this devastation. First, elderly residents with comorbidities had an increased risk of mortality from COVID-19 (Dean et al., 2020). Second, minorities, due to adverse experiences pertaining to social determinants of health, were at an increased risk of transmission and mortality rates (DeVoe et al., 2016; Krishnan et al., 2020).

Researchers have sought to identify the factors associated with COVID-19 incidence, transmission, and outcomes within nursing homes (Chatterjee et al., 2020; Coughlin, 2020; Fallon et al.,

2020). Some studies indicated that nursing home quality was a differentiating factor, and nursing homes with higher ratings had considerably fewer COVID-19 cases than those with lower star ratings (He et al., 2020). Conversely, other studies suggest that nursing home quality scores were not the leading factor for infection but were related to a shortage in nurse staffing (Hefele et al., 2017). Other researchers suggest that a nursing home location in metropolitan counties increased the vulnerability for COVID-19 transmission (Gorges & Konetzka, 2020; Ouslander & Grabowski, 2020), while others documented more significant COVID-19 cases in nursing homes with a high proportion of minority residents (He et al., 2020).

Statement of Problem

The coronavirus pandemic negatively impacted nursing home patient outcomes, especially for minority residents (He et al., 2020). Blacks experienced an increased rate of transmission from COVID-19. Despite accounting for one-third of the United States COVID-19 cases, Blacks were twice as likely to die from the virus (Brown, 2020; Coughlin, 2020). Thus, within the nursing home setting, minority residents experienced additional vulnerability to COVID-19. The coronavirus pandemic amplified concerns about existing health disparities in minority populations in nursing homes (Brown, 2020; Campbell et al., 2016; Grabowski & McGuire, 2009).

Previous researchers have extensively studied the quality of care in nursing homes and the race/ethnic disparities between different facilities (Brown, 2020; Campbell et al., 2016; Grabowski & McGuire, 2009). Despite existing knowledge on racial/ethnic disparities in nursing homes, researchers and policymakers have been unable to develop solutions to eliminate the disparities experienced by minority residents, justifying the deep concern and need for research about the disproportionate impact of COVD-19 on minorities in nursing homes (Campbell et al., 2016; Coughlin, 2020; Fiscella & Sanders, 2016; Grabowski & McGuire, 2009). This research was necessary to examine inequity in COVID-19 outcomes, particularly in nursing homes predominantly serving minority residents in predominantly minority counties. The results of this research may create an opportunity for additional research on public health policy development for equity of care for minority residents in nursing homes.

Purpose of Study

The purpose of this research study was to use Avedis Donebedian's conceptual model of quality healthcare as a framework to determine if quality of care differences (pertaining to COVID-19) exist in nursing homes with a greater minority resident population and located in a county with a predominantly minority population, compared to other nursing homes. Identifying those factors influencing inequity between nursing homes related to nursing home resident's COVID-19 health outcomes may help target health quality improvement opportunities for future research.

The study used a quantitative research design to examine the variables influencing the COVID-19 outcomes for minority residents in United States nursing homes. The key independent variable was defined as the interaction between the nursing home county's racial/ethnic demographic characteristics and the nursing home resident's racial/ethnic demographic characteristics. The nursing home and county's racial/ethnic demographic was operationalized as "majority" White population (low minority) versus "not-majority" White population (high minority). This definition was based on the race/ethnic demographic characteristics of the county. Counties or nursing homes were defined as majority White if the percentage of the White population or residents were more than 50%; otherwise, they were classified as a high minority population or residents.

To answer the study's research questions and test its hypotheses, three different dependent variables were examined. The first dependent variable was the presence of a ventilator dependent unit and was defined as whether the nursing home had a ventilator dependent unit during COVID-19. The second and third dependent variables were defined as the total number of confirmed COVID-19 cases and the total number of COVID-19 deaths in United States nursing homes, respectively. All outcome variables were assessed in February 2021, when the data were downloaded to be used for analysis.

Research Questions and Hypotheses

The following research questions guided the research process:

Research Question 1 (RQ1): Are United States nursing homes with more minority residents in predominantly minority racial/ethnic counties less likely to have a ventilator dependent unit during the COVID-19 pandemic?

Research Question 2 (RQ2): Are United States nursing homes with more minority residents in predominantly minority racial/ethnic counties more likely to have higher resident total confirmed COVID-19 cases?

Research Question 3 (RQ3): Are United States nursing homes with more minority residents in predominantly minority racial/ethnic counties more likely to have higher resident total COVID-19 deaths?

The following hypotheses guided the research process:

H1: Nursing homes with higher minority residents located in predominantly minority racial/ethnic counties are less likely to have ventilator dependent units present.

H2: Nursing homes with higher minority residents located in predominantly minority racial/ethnic counties are more likely to have higher resident total confirmed COVID-19 cases.

H3: Nursing homes with higher minority residents located in predominantly minority racial/ethnic counties are more likely to have higher resident total COVID-19 deaths.

Delimitations

This study was limited to skilled nursing facilities and excluded hospitals and other congregate healthcare facilities such as hospice, assisted living, and inpatient rehabilitation facilities. Preliminary COVID-19 reporting data oscillated at the beginning of the pandemic due to the absence of reporting requirements. The study's scope was limited to data from facilities located in the United States reporting COVID-19 data between June 2020 and January 2021. The June 2020 data were selected to capture data after Centers for Medicare and Medicaid Services (CMS) began requiring facility reporting of cases and deaths. Data collection was secondary and limited to publicly available databases. Because the CMS did not require nursing facilities to report COVID-19 cases and deaths by race/ethnicity, facility-level data on

resident racial/ethnic composition was gathered from the Brown School of Public Health's long-term care database (LTCfocus, 2021).

Significance to Nursing Home Race/Ethnic Health Equity during COVID-19

Nursing home residents were an extremely high-risk population for adverse outcomes and mortality during COVID-19, and urgent research was needed to understand the characteristics of transmission (Fallon et al., 2020; Li, Temkin-Greener, et al., 2020). Contributing factors to increased mortality rates in multiple states were race/ethnicity and geography, with disproportionate minorities, especially Blacks, impacted (Louis-Jean et al., 2020).

Improving healthcare and health outcome disparities associated with race/ethnicity will require creating policies that address structural health inequity (Poteat et al., 2020). This research contributes to understanding COVID-19 virus health outcomes for minority nursing home residents and examines its correlation with jointly assessed factors of nursing home residents' racial/ethnic composition and the racial/ethnic composition of the facility's location. With this examination, I sought to identify the factors that disproportionately increase the likeliness of COVID-19 confirmed cases and death rates in minority residents. Focusing on COVID-19 morbidity and mortality disparities in United States nursing homes promotes a discussion around the racial/ethnic dynamics between healthcare systems and the influence on resident outcomes.

Definition of Terms

Discrimination: The practice of treating similarly situated individuals differently because of race, gender, sexual orientation, appearance, or national origin; unfair treatment based on individual characteristics or group membership is a potential determinant of racial/ethnic disparities among older adults (Thrasher et al., 2012; Williams et al., 2019).

Health disparity: The systematic racial and ethnic differences in the incidence, prevalence, mortality, and burden of disease and access to quality healthcare impacting health outcomes (Atrash, 2018; Louis-Jean et al., 2020; Satcher, 2006).

Health inequity: The product of social injustices and the prevention of attaining the highest level of health for all populations (Dover & Belon, 2019; Liburd et al., 2020).

Social determinants of health (SDH): The conditions in which people are born, grow, work, live, and age; the broader set of life circumstances and systems shaping daily life conditions (Farley et al., 2020; Shokouh, 2017).

Summary of Chapter

The inequitable distribution of morbidity and mortality rates among vulnerable populations due to the COVID-19 pandemic lifted the shade on the history of racial and socioeconomic disparity in the United States (Li, Cen, et al., 2020; Louis-Jean et al., 2020). This study's research questions were used to explore the association among the racial/ethnic composition of United States nursing homes and that of their geographic location and (a) the availability of COVID-19 specific equipment as well as (b) minority nursing home residents' COVID-19 health outcomes. The study's goal was to examine the interactive effect of resident and location characteristics on COVID-19 health outcomes.

Chapter 2 provides a comprehensive review of the literature. The literature review defines and provides background to minority residents' nursing home residency and history of healthcare disparity, including the history of nursing homes, evidence of inequity experienced by racial/ethnic groups in nursing homes, and the proliferation of inequity during the novel coronavirus 2019 pandemic. The conceptual framework that guided this study is also summarized. Chapter 3 describes the research methodology, data sources, study population, and study sample. Chapter 4 describes the research findings, including presenting detailed results of statistical analyses. Finally, Chapter 5 summarizes the research results, draws research conclusions, explores public health implications, and provides recommendations for future research.

CHAPTER 2

LITERATURE REVIEW

Introduction

This chapter reviews previous research on factors influencing morbidity and mortality disparities attributed to COVID-19 in nursing homes and among racial/ethnic populations. This review also includes an examination of the long-term care history in the United States, the social implications of racial disparities, and its associated influence on the healthcare system. The Donabedian conceptual model, which has informed previous research on healthcare quality standards in United States nursing homes was presented as the conceptual foundations of this study.

The Issue

The COVID-19 Pandemic

The COVID-19 global pandemic is the greatest challenge to community health this century, and it has had the most significant impact on vulnerable populations, such as senior citizens and minorities (Flatharta, 2020; He et al., 2020; Holtgrave et al., 2020). COVID-19 is a severe respiratory syndrome coronavirus 2 (SARS-Co-V-2) transmitted through respiratory droplets from person to person contact with an infected individual, with symptoms ranging from mild to severe (Dean et al., 2020; Louis-Jean et al., 2020). Nursing homes' congregate nature and resident population increase the risk of transmission, morbidity, and mortality associated with COVID-19 (Dean et al., 2020). The Centers for Disease Control and Prevention (CDC, n.d.) advised that severe illness from COVID-19 could include hospitalization, placement in an intensive care unit, the use of a ventilator to assist with difficulty breathing, and death.

By January 10, 2021, there had been a total of 549,852 United States nursing home residents with confirmed cases and 107,107 COVID-19 deaths (*COVID-19 Nursing Home Data*, 2021). Nursing home residents represent less than.5% of the United States population; however, they made approximately 36% of the deaths related to COVID-19 in the early waves of the pandemic (Grabowski & Mor, 2020). The pandemic highlighted the need for increased public and political attention on the inadequate preparation and unique infection control challenges nursing homes face (Fallon et al., 2020). Further confounding the

pandemic in the United States was the history of racial, ethnic, and colonial oppression, which has allowed health equity to remain in the margins of the public health response efforts (Afifi, 2020).

COVID-19 and Vulnerable Populations

During the earlier waves of COVID-19, long-term care (LTC) facilities were the United States epicenter of COVID-19 for vulnerable populations (Morris et al., 2020; Xu et al., 2020). By August 2020, more than 60,000 deaths occurred in United States nursing homes and LTC facilities, accounting for half of the total COVID-19 related deaths in the country (McGarry et al., 2020). Kirkland, Washington, is where the first United States nursing home confirmed COVID-19 case of infection occurred (Morris et al., 2020; Xu et al., 2020). The initial case occurred at Life Care Center of Kirkland on January 22, 2020, and the first outbreak occurred in the same community on February 27, 2020 (Morris et al., 2020). On February 29, 2020, the Seattle & King County Public Health Department reported the first COVID-19 death (Morris et al., 2020). By March, every state in the United States began reporting cases (Morris et al., 2020). On March 13, 2020, the United States President declared a national emergency, with CMS issuing guidance for infection control and prevention in nursing homes and recommendations for visitor restriction (Morris et al., 2020).

Nursing homes experienced a disproportionate share of COVID-19 cases, with one-third of COVID-19 related deaths in the United States during the first wave (Abrams, 2020; Gorges & Konetzka, 2020; Szczerbinska, 2020). There were a multitude of factors that contributed to the increased number of cases and deaths. Nursing homes often care for older residents who are chronically ill, physically disabled, and have multiple comorbidities, increasing their susceptibility to COVID-19 and the complication of respiratory failure and death (Fallon et al., 2020; T. T. Shippee et al., 2020; L. Wang et al., 2020; Xu et al., 2020). Additionally, nursing homes have a high proportion of functional and cognitive impaired residents, creating an increased risk of virus transmission and complications with infection control efforts (Fallon et al., 2020). Furthermore, the congregate living setting and the physical care assistance provided with daily living activities in nursing homes increased the risk of COVID-19 exposure, outbreaks, and deaths (Afifi, 2020; Ouslander & Grabowski, 2020). Also, due to physical plant

constraints, some facilities could not isolate their residents or create quarantine spaces (Ouslander &

Grabowski, 2020). The COVID-19 pandemic unearthed the persistent healthcare challenges in long-term

care facilities and spotlighted how unprepared they were for an infectious disease outbreak (Szczerbinska,

2020).

Epidemiological data from multiple states across the United States indicated a racial/ethnic

pattern of disparities in the COVID-19 morbidity and mortality rates (Abedi et al., 2020). It

disproportionately impacted the Black population, resulting in higher transmission and death rates (Abedi

et al., 2020; Afifi, 2020; Coughlin, 2020). The statistical data indicated that Blacks had greater mortality

rates resulting from COVID-19 complications than other racial/ethnic populations (Louis-Jean et al.,

2020). Health inequities experienced by racial/ethnic minorities intensified the risk of severe outcomes of

COVID-19 (Afifi, 2020). These inequities included pre-existing comorbidities, economic insecurity,

residential environment, and implicit bias (Farley et al., 2020). Historical context, systems, and structures

placed minority racial/ethnic populations, the elderly, and underserved communities at risk (Farley et al.,

2020).

Background of Issue

Nursing homes are responsible for providing 24-hour care for elderly adults and individuals with

chronic medical conditions. Sometimes the care provided includes assistance with functional and

cognitive impairments that cannot be adequately managed at home and require nursing supervision

(Nadash et al., 2019). By 2050, projections are that almost 90 million, or 42% of the United States

population, will be 65 years and older (Cassie & Cassie, 2013; Chisholm et al., 2013). For the senior

population, between 2010 and 2030, population projections estimated an increase in the minority

population of 160%, and for Whites, 59% (Cassie & Cassie, 2013). These statistics forecast a future with

a diverse nursing home racial/ethnic population.

United States nursing homes have standard government regulations with strict requirements for

care delivery. Contrary to these established requirements, there has been a history of low quality,

including low nurse staffing ratios, poor clinical outcomes, and high instances of process and outcome-

based deficiencies (Grabowski et al., 2008; Werner & Konetzka, 2010). Nursing homes with a disproportionate percentage of Medicaid residents and minority residents frequently have limited financial and clinical resources, resulting in low quality and poor safety outcomes for these residents (Li, Temkin-Greener, et al., 2020). Unfortunately, racial/ethnic disparities in the quality of healthcare delivery have been a concern for nursing home residents and policymakers for many decades (Campbell et al., 2016; Grabowski & McGuire, 2009; Li, Harrington, Temkin-Greener, et al., 2015).

History of Long-term Care in the United States

Before establishing nursing homes in the United States, facility care options for the elderly population unable to remain in their homes included almshouses, convalescent homes, homes established by women's or church groups, and rest homes. Historical events, family resources, socioeconomics, and mental and health needs contributed to elder residential placement in facilities (Watson, 2010). During the 17th century, English settlers brought the concept of almshouses, also known as poor houses, to the United States (Watson, 2010). Almshouses were often undesirable places and provided care, shelter, and meals for the elderly, orphans, and the mentally ill (Watson, 2010). The deplorable conditions in almshouses led to the development of convalescent homes (Watson, 2010). In the 20th century, less unpleasant institutions, in the form of board-and-care homes, evolved to care for the aging population (Watson, 2010). Once societal beliefs began to shift towards accepting government regulation in care homes, nursing institutions began providing care for this elderly population (Bohm, 2001).

In 1935 the Social Security Act (SSA) was established to provide states with federal funds to provide financial assistance to impoverished seniors living in public institutions, such as nursing homes (Bohm, 2001; KFF, 2015). The SSA was amended in 1950 to require medical care benefit payments for nursing home residency (KFF, 2015). By the late 1960s, the establishment of health and safety standards resulted in the modern nursing home industry (Castle & Ferguson, 2010). In 1965, Congress enacted Medicare and Medicaid under Title XVIII of the SSA. These programs provided health coverage for the elderly, disabled, and low-income populations (Bohm, 2001).

Medicare is a federal healthcare coverage program, and Medicaid is a federal-state healthcare coverage program. The CMS branch of the U.S. Department of Health and Human Services (USDHHS) operates the Medicare and Medicaid Program. CMS develops and enforces quality and safety standards across the United States healthcare system. Medicare and Medicaid-certified nursing homes are required to provide equal quality of care to residents irrespective of payer source (Grabowski et al., 2008). Fraud and abuse in nursing homes led to amendments to the SSA in 1967. The Health Care Financing Administration (HCFA) was created in 1977 to coordinate Medicare and Medicaid, developing the nursing home certification process, and certification standards under HCFA's jurisdiction (Castle & Ferguson, 2010).

In 1986, after decades of quality of care complaints in nursing homes, the Institute of Medicine published a report demanding improvement in the quality monitoring systems (Werner & Konetzka, 2010). The Nursing Home Reform Act (NHRA) passed by Congress in 1987 was part of the Omnibus Budget Reconciliation Act to improve the quality of care in nursing homes through greater government regulation (Bohm, 2001; Zhang et al., 2019). This reform mandated extensive regulatory controls and created a system with resident-specific assessments and care plans (Werner & Konetzka, 2010). The result was a national guideline for minimum standards of care and the rights of individuals residing in certified nursing facilities. Nursing homes' experiences during COVID-19 suggest that the current NHRA government regulation system for monitoring the quality of care in nursing homes may be insufficient (Werner, 2020). COVID-19 uncovered a potential failure to create a safe and effective long-term care system (Werner, 2020), especially for a vulnerable population of residents in LTC facilities who are at increased susceptibility to respiratory diseases such as influenza and common human coronaviruses (Li, Temkin-Greener, et al., 2020).

In 2008, CMS introduced a five-star quality rating system that uses health care surveys, quality measures, and staffing on the Nursing Home Compare (NHC) website (CMS.gov, 202). NHC data contains the history of health inspections, resident care, staffing ratios, and self-reported quality outcomes. This public reporting rating system aims to encourage nursing homes to improve quality

(Zuckerman et al., 2019). Analysis of the five-star rating facility characteristics reveal that low-quality ratings were correlated with larger, for-profit facilities located in metropolitan areas with a high proportion of Black residents (Bowblis et al., 2020; Zuckerman et al., 2019).

Over the next 30 years, nursing home residency is projected to increase with minority populations increasing from 20 to 42% for those 65 years and older (Chisholm et al., 2013). The growth in minority populations utilizing nursing homes will produce a parallel increase in healthcare expenditures. In the United States, healthcare facilities and continuing care retirement communities' health expenditures in 2016 were an estimated $163 billion.

Nursing home capacity in the United States totaled 15,600 facilities and 1.7 million nursing home beds (*National Center for Health Statistics*, 2020). Considering this volume of nursing homes, the low quality of care in United States nursing homes is a significant concern for the residents, families, clinicians, and policymakers. Research discloses trends in persistent racial and ethnic disparities in nursing homes, and groups systemically discriminated against based on race/ethnicity experience health disparities more significantly than Whites (Bliss et al., 2017; Fiscella & Sanders, 2016; Li & Cai, 2014). Achieving health equity, eliminating disparities, and improving all populations' health is one of the priority objectives of the USDHHS Healthy People 2030 initiative (Liburd et al., 2020).

Issues surrounding the quality delivery of care in nursing homes have been prevalent in the United States (Harrington & Edelman, 2018). Research indicates that one of the constant challenges with nursing homes delivering quality care is staffing (Chisholm et al., 2013; Wang et al., 2019). Staffing is a variable that can positively or negatively impact all the other physical and clinical indicators for quality of care. Examples of staffing challenges include staffing levels barely meeting state minimum requirements, staffing shortages in violation of state requirements, staff levels not appropriate to resident acuity, and staffing shortages that have resulted in missed delivery of patient care (Harrington & Edelman, 2018).

Racial/Ethnic Demographics of Nursing Homes and Disparities in Care

According to the CDC (*National Center for Health Statistics*, 2020), nursing homes and skilled nursing facilities admit over four million Americans every year. The racial/ethnic population is rapidly

shifting, with minorities comprising 54% and Blacks accounting for 15% of nursing home residents (Gary et al., 2011). Between 1999 and 2008, the increase in minority nursing home population exceeded that of the overall United States minority population, indicating unequal access or ability to remain home or reside in community-based long-term care options, such as assisted living facilities (Feng et al., 2011). Blacks disproportionately reside in lower quality and lower performing nursing homes, with the proportion of Black residents living in a nursing home as a predictor for disparities (Chang, 2012; Chisholm et al., 2013). The increased percentage of minorities in nursing homes is a growing healthcare concern, as the history of racial/ethnic-based disparities in nursing home quality of care, coupled with this growth, multiplies the inequities (Bliss et al., 2017; Gary et al., 2011).

Historically, Whites moved into nursing homes at a higher rate than other groups, but the current nursing home admissions trend projects minority populations will exceed Whites (Gonzalez, 2019). The racial/ethnic demographic population of nursing homes is changing, with an increased percentage of Black and a decreasing proportion of White residents (Li, Harrington, Temkin-Greener, et al., 2015). Whites residing in nursing homes decreased from 77% in Q1 2012 to 74% in Q1 2019 (*Paving the Way to Equity: A Progress Report (2015-2021)*, 2021). Concurrently, Blacks' residency rate in nursing homes increased from 14 % in Q1 2012 to 15% in Q1 2019 (*Paving the Way to Equity: A Progress Report (2015-2021)*, 2021). As the populations of nursing homes' residency shifts, it becomes increasingly important to address the inequity experienced by minorities.

There is a wide gap in racial/ethnic disparities in the quality of care received across nursing homes based on the resident population's racial/ethnic demographic (Li, Harrington, Mukamel, et al., 2015). Minorities often receive care from lower-quality health providers and suffer worse health outcomes (Rahman & Foster, 2015). Racial/ethnic disparities in LTC facilities include financing, access to care, quality of care, and service delivery (T. P. Shippee, O. Akosionu, et al., 2020) . Racial/ethnic disparities have existed before researchers began using data to measure outcomes, and discrimination has influenced how minority groups interact with the healthcare system (Atrash, 2018; Gonzalez, 2019). These experiences of discrimination negatively impact health and potentially accumulates over time

(Gonzalez, 2019). Several factors, such as personal beliefs and preferences, communication between patient and health provider, and the healthcare system's culture, contribute to health disparities (Kilbourne et al., 2006). Health disparities arise from several additional factors, including inequity, socioeconomics, healthcare quality, and policy factors (Atrash, 2018).

Long-term care facilities are the most racially homogenous institutions of all healthcare entities (Rahman & Foster, 2015). Data shows that minority residents receive nursing home care inferior to that of Whites (T. P. Shippee, W. Ng, et al., 2020). Minority residency is often clustered in nursing homes, with two-thirds of Blacks living in 10% of the nursing homes (Cassie & Cassie, 2013). Blacks were also more likely to live in nursing homes with a high proportion of Medicaid recipients and more significant inspection violations (Cassie & Cassie, 2013). Subtle and unconscious forms of discrimination from the healthcare providers and care structure contribute to disparities (Smith et al., 2008).

The disparities in nursing home quality have been attributed to where the minority resident receives care (Campbell et al., 2016). Research suggests that the less racially diverse the nursing home, the more significant observed disparities (Chang, 2012). Specifically, Black older adults residing in nursing homes with a high proportion of minorities experience an increased degree of disparity (Chang, 2012; Smith et al., 2008). There is a disparity in processes of care and the clinical quality of care experienced by Black nursing home residents, such as increased use of physical restraints, indwelling catheters, feeding tubes, and prescribing more antipsychotic medications than White nursing home residents (T. P. Shippee, W. Ng, et al., 2020). The availability of requisite medical equipment to handle resident care needs also impacts the quality of care delivered. Within the context of COVID-19, ventilators represent one type of medical equipment needed for disease management. Patients severely affected with COVID-19 who require hospitalization sometimes require a mechanical ventilator (Iyengar et al., 2020). Unfortunately, the pandemic has resulted in a shortage of ventilators, and little is currently known whether or not racial/ethnic disparities exist as it pertains to access to ventilators in United States nursing homes (White & Lo, 2020).

Neighborhood Racial/Ethnic Population of Nursing Homes

Nursing home residency mirrors the residential patterns of the surrounding metropolitan areas and has remained relatively chromatic (Smith, 2007). Some factors that guide nursing home selection include economics, health insurance options, personal preference, or health providers' referrals (Gonzalez, 2019). Research suggests distance and race-based preferences direct nursing home selection and contributes to racial disparities in nursing home quality (Rahman & Foster, 2015). Blacks experience higher rates of disability as they age compared to Whites (*Paving the Way to Equity: A Progress Report (2015-2021)*, 2021). In conjunction with other factors, the weighted value of the geographic distance directly impacts racial disparity in the quality of care (Rahman & Foster, 2015).

Nursing home placement and selection reflect patterns of quality of care disparities across neighborhoods and facilities (Grabowski & McGuire, 2009). (Rahman & Foster, 2015) posited there are three sources of racial disparity and inequality in nursing home selection including: (a) nursing home proximity to current residence, (b) those offering advice intentionally provide suggestions for locations with a high proportion of a similar race/ethnicity, and (c) Blacks and Whites may have differences in the inclination or capability to pay for a quality nursing home. There is a disproportionate concentration of minorities in low-quality and low financially performing nursing homes (Chisholm et al., 2013). These nursing homes are often located in depressed socioeconomic neighborhoods, and the residents have worse outcomes (Li, Temkin-Greener, et al., 2020). To develop a corrective strategy to address across facility race/ethnic disparities, the sources of these disparities must first be identified (Cai et al., 2010). The disproportionate impact of the COVID-19 pandemic in nursing homes presents an opportunity to examine the interactive effect of resident race/ethnicity and location racial/ethnic composition on residents' health outcomes in nursing homes.

History of COVID-19

Novel Coronavirus 2019 is a highly contagious disease caused by an RNA virus, severe acute respiratory syndrome (SARS-Co-V-2). It was named COVID-19 by the WHO and can manifest as asymptomatic, mild, or symptomatic with moderate symptoms or severe, causing significant morbidity

and mortality (Kannan, 2020; Nair et al., 2020; L. Wang et al., 2020). Between November and December 2019, several people were admitted to the hospital with cases of the SARS-Co-V-2 with atypical pneumonia, possibly originating from the Huanan Seafood Market in Wuhan, China. Infected individuals may have had exposure to live animals sold (Kannan, 2020; Nair et al., 2020). Genome analysis revealed a high genome sequence recognition rate with bats, implying an origination from bats (L. Wang et al., 2020). The initial individuals who contracted the coronavirus disease were in contact with the market (Kannan, 2020). However, subsequent individuals testing positive for COVID-19 had not visited the market, indicating a probability of human-to-human transmission (Kannan, 2020).

On January 20, 2020, the first case of SARS-CoV-2 in the United States was confirmed, and subsequently, all 50 states eventually reported confirmed cases (Martines et al., 2020). Research suggests the virus transmission mode is through aerosol transmission with the inhalation of viral particles through infected droplets and close contact with individuals positive for COVID-19 (Kannan, 2020; Nair et al., 2020; J. Wang et al., 2020). SARS-CoV-2 produces an acute viral infection with an incubation period between 2 to 10 days (Kannan, 2020; L. Wang et al., 2020). Some common viral symptoms include fever, cough, myalgia, dyspnea, fatigue, diarrhea, vomiting, and acute respiratory syndrome (Kannan, 2020; L. Wang et al., 2020). Severe infections include acute respiratory distress syndrome, acute heart injury, impaired renal function, and fatal pneumonia (Kannan, 2020; L. Wang et al., 2020).

Before developing a Food and Drug Administration (FDA) approved vaccine in the United States, the CDC advised strict adherence to infection control precautions to contain the spread of infection and eliminate the transmission route (L. Wang et al., 2020). Multiple prevention and control measures were put in place in the United States. Examples of such preventative measures included facemask mandates, social distancing requirements, nursing home visiting restrictions, and senior citizen prioritization for vaccine distribution. These steps were crucial in preventing, mitigating, and controlling COVID-19 outbreaks in nursing homes (Sugg et al., 2020).

After rigorous clinical trials, the FDA began providing emergency use authorization (EUA) for COVID-19 vaccines in December 2020 (FDA, 2021c). The EUA was supported by HHS, with scientific

evidence supporting the emergency use of vaccines to effectively prevent COVID-19 (USFDA, n.d.b.). On December 11, 2020, the FDA issued the first vaccine EUA for the Pfizer-BioNTech COVID-19 vaccine to prevent COVID-19 (FDA, 2021c). A second FDA vaccine EUA was issued for the Moderna COVID-19 vaccine on December 18, 2020 (FDA, 2021b). On February 27, 2021, a third FDA vaccine EUA was issued for Johnson & Johnson COVID-19 vaccine (FDA, 2021a). After the vaccines were made available to the public, the FDA and experts continued to track data to ensure public safety and monitor vaccine effectiveness (*National Center for Health Statistics*, 2020).

COVID-19 Impact on Minorities

Systemic and social inequities resulted in a disproportionate impact and an increased risk of morbidity and mortality for racial/ethnic minorities (cdc.gov, 2020). Emergent data illustrated that minority racial/ethnic populations were experiencing adverse outcomes of the coronavirus pandemic at staggering rates, with Blacks more vulnerable than any other ethnic group (Abedi et al., 2020; Afifi, 2020; Farley et al., 2020; Poteat et al., 2020). Blacks were 13% of the United States population but represented one-third of the COVID-19 cases and were twice as likely to die from coronavirus (Brown, 2020).

The COVID-19 pandemic exposed the history of health inequity experienced by Blacks, exacerbated societal biases, and amplified healthcare inequalities (Calderon-Larranaga, 2020; Farley et al., 2020). It forced Americans to confront the moral responsibility to improve population health and reduce health inequities and the social and structural issues of health and wellness (Afifi, 2020; Brown, 2020). Factors contributing to increased risk included historical and current discrimination in the healthcare system, health equity, and social determinants of health (cdc.gov, 2020).

COVID-19 Impact on Nursing Homes

The average demographic of nursing home residents included older adults with chronic health conditions, often with compromised physical and cognitive capabilities, placing them at a greater risk of COVID-19 (Li, Temkin-Greener, et al., 2020). While COVID-19 exhibits mild symptoms in most cases, it can be life-threatening in vulnerable populations (Nair et al., 2020). Eight out of 10 COVID-19 deaths in the United States occurred in adults 65 and older (cdc.gov, 2020). When the disease infected an older

adult, the progression of illness was faster and more severe, likely attributable to compromised immunity and underlying health conditions (X. Wang et al., 2020). If an older adult had a pre-existing health condition such as diabetes, hypertension, or cardiovascular disease, it increased their susceptibility to COVID-19 disease, especially in a nursing home environment (Nair et al., 2020). The congregate setting of nursing homes further exacerbated disease transmission risk and increased the opportunity to spread communicable diseases such as COVID-19 (Sugg et al., 2020).

National studies reported COVID-19 death rates were most significant in nursing homes during the initial waves of the pandemic, with nursing homes accounting for approximately 40% of the documented deaths and a high percentage of those deaths in Black residents (Abrams, 2020; Chen et al., 2020). Results from studies have found that nursing home residents were at the highest risk of COVID-19 infection in densely populated, predominantly minority counties where the surrounding population had high incidence rates (Chatterjee et al., 2020; Coughlin, 2020). Counties with larger and minority populations had higher risks of COVID-19 infection (Abedi et al., 2020). COVID-19 outbreaks in nursing homes were associated with facility size, location, and community factors such as the percentage of minorities (Abrams, 2020; Sugg et al., 2020). Urban areas had higher COVID-19 cases and increased opportunities to spread the virus (Farley et al., 2020; T. T. Shippee et al., 2020; Szczerbinska, 2020). The percentage of non-White residents residing in a nursing home was also a predictor of virus prevalence (Gorges & Konetzka, 2020).

Many variables contributed to the rapid spread and prevalence of the coronavirus in United States nursing homes, including the predisposed vulnerability of the elderly population and inadequate resources for COVID-19 testing, and availability of rapid and accurate testing within the facility (Ouslander & Grabowski, 2020; Patel et al., 2020; White et al., 2020). A public health approach to decreasing COVID-19 morbidity and mortality in nursing homes required rapid, accurate, and regular testing of residents, staff, and contractors (Ouslander & Grabowski, 2020; Patel et al., 2020). However, most nursing facilities had limited COVID-19 testing capacity, preventing an accurate diagnosis of positive cases in residents and staff (Ouslander & Grabowski, 2020). Testing allowed staff to detect cases, implement strategies for

infection prevention, and mitigate exposure within the facility (Binder et al., 2020; White et al., 2020). Once COVID-19 residents were identified, measures could be taken to cohort them in designated areas within the facility or at a separate facility (Kimball et al., 2020). COVID-19 testing within nursing facilities was a critical epidemiologic surveillance tool for virus detection, mitigation strategies, and prevention of outbreaks (White et al., 2020).

Because of the increased morbidity and mortality burden on minority populations, LTC facilities' current racial/ethnic disparities were likely to increase (T. P. Shippee, O. Akosionu, et al., 2020). While socioeconomic factors correlate to COVID-19 differences in the Black population, other considerations such as systemic health inequity and marginalization in the healthcare system were possible contributors (Coughlin, 2020). Existing barriers to minority populations receiving quality care in LTC facilities during the novel coronavirus 2019 pandemic included cumulative social determinants of health over the life course, inequity in clinical care and quality of life in nursing homes, and challenges faced by disproportionate minority and immigrant staff (T. P. Shippee, O. Akosionu, et al., 2020).

Summary of the Literature

Vulnerable populations, including racial/ethnic minorities, economically disadvantaged, and those with chronic health conditions, experienced higher risk factors, reduced access to care, and increased morbidity and mortality from COVID-19 than the general population (Joszt, 2018). The increased percentage of minorities in nursing homes and the history of racial/ethnic-based disparities in nursing home quality of care magnified these existing inequities (Bliss et al., 2017; Gary et al., 2011). During a White House coronavirus taskforce press briefing, Dr. Anthony Fauci, director of the National Institute of Allergy and Infectious Disease, confirmed that advanced cases of COVID-19, including those that led to death, were disproportionately prevalent in the Black community (Coughlin, 2020; Gifford, 2020). Existing societal biases and inequities in healthcare escalated morbidity and mortality in underserved populations and posed unique risks to vulnerable residents in nursing homes (Farley et al., 2020).

Racial/ethnic quality of care disparities in healthcare settings have been a concern for nursing home residents and policymakers for many decades (Campbell et al., 2016; Grabowski & McGuire, 2009; Li, Harrington, Mukamel, et al., 2015). Institutional discrimination, inequality, lower socioeconomic status, and underprivileged neighborhoods contribute to healthcare gaps in the elderly population (Gonzalez, 2019). Further, inequity experienced by racial/ethnic groups and discriminatory practices in access to higher-quality nursing homes in the United States is a systemic issue requiring targeted interventions (Bliss et al., 2017; Smith, 2007). Without institutional interventions to address health equity in policy and practice, the COVID-19 crisis and disparity among ethnic/minority populations in nursing homes will worsen (Atrash, 2018; Bleich et al., 2019; Brown, 2020; Butkus et al., 2020).

Background of Conceptual Model

The COVID-19 virus impacts the United States population in the context of existing inequities in the fundamental causes of disease and disparity between race/ethnicity (Afifi, 2020). The WHO's suggested primary interventions include handwashing and sanitizing, social distancing, stay-in-place orders, and secondary self-isolation strategy when COVID-19 symptoms appear and seek medical treatments if symptoms worsen (Afifi, 2020). These suggested prevention and mitigation strategies focus on biological individual-level interventions but fail to provide transmission mitigation strategies in communal and congregate settings such as nursing homes. Within such settings, facility-level characteristics, including organizational structure and processes may influence care delivery and outcomes. Using the Donabedian model of healthcare quality, I sought to examine contextual rather than individual determinants of COVID-19 outcomes in United States nursing homes.

Donabedian Model

Donabedian's healthcare quality model provided a conceptual framework for this research study of COVID-19 health outcomes in United States nursing homes. Dr. Avedis Donabedian developed the healthcare quality framework in 1966 (Binder et al., 2020; Mitchell et al., 1988). The Donabedian model is a widely used framework dominant in healthcare quality research and has been applied for quality improvement in various healthcare settings (Santry et al., 2020). Researchers have used his model to

guide the study of a wide breadth of topics over the years, including quality of care costs, emergency general surgery quality, patients' perception of nursing service quality, and COVID-19 response in hospitals (Binder et al., 2020; Kobayashi et al., 2011; Nuckols et al., 2013; Santry et al., 2020).

Donabedian's model follows a linear perspective, with a synergistic relationship between structure, process, and outcome (Binder et al., 2020; Mitchell et al., 1988). The model classifies quality in healthcare as a product of structure and process, and the model has been used in quality measurements (Brien et al., 2009). The model hypothesizes that improving the care structure should improve the clinical process, thus improving patient outcomes (Binder et al., 2020). As applied to this study, the model's logic suggests that structural and process variation between nursing homes may explain differences in COVID-19 outcomes.

Donabedian's structure measures are the characteristics of the location where care occurs, including architectural features, staffing, and access to necessary equipment (Binder et al., 2020; Brien et al., 2009; Santry et al., 2020). Measuring structural characteristics helps indicate whether healthcare delivery is under conditions conducive to high-quality care (Brien et al., 2009). As applied in this study, the structure characteristics included facility nurse staffing, location, ownership type, and county racial/ethnic demographic. The staffing variable evaluated the shortage of nurse staff, including registered nurses, licensed practical nurses, and vocational nurses. Nursing home location referred to rural or urban placement. Facility ownership type was identified as nonprofit, for-profit, or government-owned. Lastly, the county's racial/ethnic demographic was defined as majority White county and not-majority White county.

Donabedian's process measures involve care delivery and workflow for patient care (Binder et al., 2020; Santry et al., 2020). Examples include medication administration and staff appropriate safety precautions to avoid infection transmission (Brien et al., 2009). As applied in this study, the process characteristic within the context of COVID-19 was assessed as the presence of a ventilator dependent unit in the facility for COVID-19 as reported by the provider.

Donabedian's outcome measures are healthcare effects on patients and populations (Binder et al., 2020; Santry et al., 2020). Outcome characteristics range from the patient's health status or care experience after care delivery, quality of life, or mortality (Brien et al., 2009). As applied in this study, the outcome characteristics included residents confirmed COVID-19 cases and resident deaths attributable to COVID-19. COVID-19 cases were measured as the number of residents with laboratory confirmed positive cases reported by the provider. Resident COVID-19 deaths were assessed as the number of residents with suspected or laboratory COVID-19 test results who died in the nursing facility or another location reported by the provider. This study posited that nursing homes with higher cumulative incidences of COVID-19 replicate the history of healthcare disparities in the United States (Li, Temkin-Greener, et al., 2020). Figure 1 illustrates Donabedian's model for COVID-19 quality of care health outcomes in United States nursing homes.

Figure 1

Donabedian Model: COVID-19 quality of care

STRUCTURE	PROCESS	OUTCOME
Facility Staffing - Shortage of Nurse staff Facility Characteristics - Location - Ownership Type Contextual Factors - Nursing home county racial/ethnic demographic	Ventilator dependent Unit for COVID-19 Pandemic	Residents Total Confirmed COVID-19 Cases Residents Total COVID-19 Deaths
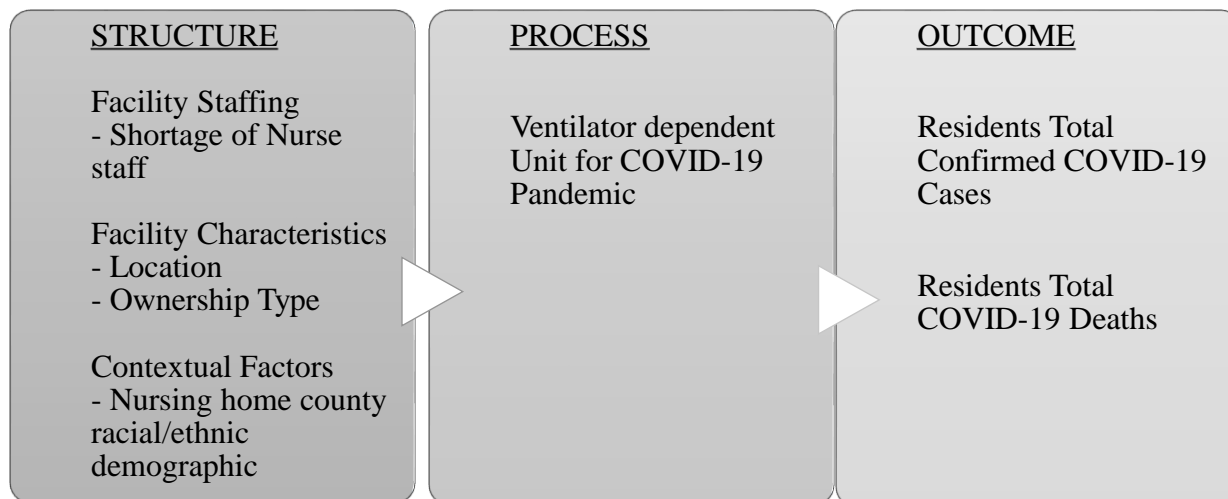
Derivation of Hypotheses

Serious quality issues exist in nursing homes, and the current nursing home regulations have mildly impacted care quality (Werner & Konetzka, 2010). In April 2020, CMS began requiring nursing homes to report cases of COVID-19 that occurred in their facilities (Chatterjee et al., 2020). A team of

researchers who studied publicly available public health data from 23 states found reported cases of COVID-19 were highest in facilities cited with high health deficiency scores, high deficiencies in emergency preparedness, and high facility-reported complaints (Chatterjee et al., 2020). I sought to understand additional organizational contextual factors contributing to adverse COVID-19 health outcomes, focusing on racial/ethnic composition.

The goal of this study was to answer the following research questions:

RQ1: Are United States nursing homes with more minority residents in predominantly minority racial/ethnic counties less likely to have a ventilator dependent unit during the COVID-19 pandemic?

RQ2: Are United States nursing homes with more minority residents in predominantly minority racial/ethnic counties more likely to have higher resident total confirmed COVID-19 cases?

RQ3: Are United States nursing homes with more minority residents in predominantly minority racial/ethnic counties more likely to have higher resident total COVID-19 deaths?

As a conceptual framework, the Donabedian conceptual model provided a model for studying COVID-19 outcomes. The model posits that healthcare quality is shaped by structural factors mediated through processes of care. Researchers hypothesize that contextual structural factors such as facility characteristics, staffing, race/ethnicity of residents, and urban location may be significantly associated with COVID-19 outbreaks in United States nursing homes (Sugg et al., 2020). Nursing homes with a higher percentage of Black residents have been previously associated with an increased probability of at least one COVID-19 case (Sugg et al., 2020). Current research has not been conclusive concerning neighborhood-level factors' influences on COVID-19 health outcomes (Sugg et al., 2020).

I focused on racial/ethnic composition to explore the racial disparities and COVID-19 outcomes in nursing homes. The study conceptualized the interaction between location and facility racial/ethnic composition and structural characteristics of nursing homes could influence COVID-19 outcomes. In line with existing literature documenting racial/ethnic disparities in nursing home care and outcomes, the following hypotheses were proposed and examined in this study:

H1: United States nursing homes located in predominantly minority racial/ethnic counties are less likely to have ventilator dependent units present.

H2: Nursing homes with higher minority residents located in predominantly minority racial/ethnic counties are more likely to have higher resident total confirmed COVID-19 cases.

H3: Nursing homes with higher minority residents located in predominantly minority racial/ethnic counties are more likely to have higher resident total COVID-19 deaths.

Summary of Chapter

In this chapter, I reviewed extensive literature highlighting the history of racialized health inequity in the United States and how the healthcare quality structure and processes impact minority resident health outcomes in nursing homes. The history of health disparities and institutional discrimination in the United States further exacerbates COVID-19 morbidity and mortality rates (Gorges & Konetzka, 2021; Louis-Jean et al., 2020). To mitigate future COVID-19 deaths in nursing homes, the factors that increase nursing homes' likelihood to experience COVID-19 cases and outbreaks must be understood (Sugg et al., 2020). In addition, more research is necessary to characterize the quality care differences within nursing homes serving underserved neighborhoods and ethnic populations (Grabowski & McGuire, 2009). Contemporary researchers urge future study of between-facility differences, solutions to reduce and eliminate disparities in nursing homes with predominately minority residents, and strategies to better serve diverse residents in our increasingly multicultural society (Amirkhanyan et al., 2018; Fashaw et al., 2020; Kronebusch et al., 2014; Thorlby, 2011).

The coronavirus pandemic exposed the consequence of ignoring health disparity interventions (Brown, 2020), and evidence regarding the long-range impact of COVID-19 on racial/ethnic minorities remains unknown (T. P. Shippee, O. Akosionu, et al., 2020). Ignoring race and ethnic-based correlations in public health surveillance will not create equity in the healthcare system (Afifi, 2020; Coughlin, 2020). Social and economic interventions are necessary to reduce racial and ethnic health disparities (Atrash, 2018). The moral aims of public health are improving population health and reducing health disparities,

which will require a collaborative effort from healthcare organizations that include data measurement, systematic analysis, and investment in developing solutions (Afifi, 2020; Thorlby, 2011).

The coronavirus has impacted numerous nursing homes throughout the United States, resulting in high resident mortality rates (Abrams, 2020). United States nursing homes were unstable and structurally deficient before the coronavirus pandemic. The catastrophic impact of COVID-19 in nursing homes resulted from the neglect of social determinants of health and health disparity in the long-term care policy (McGilton et al., 2020; Werner, 2020). The literature supported a study of COVID-19 in United States nursing homes and morbidity and mortality experienced by residents in predominately minority counties. The utilization of the Donabedian model to guide the study contributed to the growing compendium of research, evidencing its critical role in health and well-being in vulnerable populations (Reap et al., 2020).

Chapter 3 explains the purpose of the study, research approach, description of research methodology, and conceptual model application. It provides details of the data sources, population, sample, and expected impact and significance of the study. The chapter concludes with ethical considerations and limitations.

CHAPTER 3

METHODS

Introduction

As COVID-19 spread across the United States, it quickly became apparent that older adults and minority populations were experiencing greater morbidity and mortality rates than any other group (Farley et al., 2020; Sharifi & Khavarian-Garmsir, 2020). There was limited research examining residents living in high minority nursing homes and the factors impacting COVID-19 health outcomes (Abedi et al., 2020; Sugg et al., 2020).

Purpose of Study

This chapter presents the research design for determining if nursing homes with more minority residents located in counties with a high minority racial/ethnic demographic experienced disparities in COVID-19 medical equipment availability and COVID-19 health outcomes. The purpose was to utilize a quantitative research design with the Donabedian model as a conceptual framework to examine the COVID-19 outcomes in United States nursing homes between June 2020 and January 2021. The objective was to determine whether nursing home COVID-19 patient outcomes varied from one nursing facility to another based on location and resident characteristics. Also, to determine whether the availability of COVID-19 specific medical equipment in the nursing home impacts morbidity and mortality outcomes.

Research Questions

The research issue under investigation was the impact of jointly assessed factors of racial/ethnic demographics of the nursing home residents and racial/ethnic demographic of the nursing home county on resident morbidity and mortality during the COVID-19 pandemic. Based on the Donabedian model, I also examined the impact of these factors on COVID-19 processes of care, assessed through the availability of ventilator-dependent units.

The following research questions guided the research process:

RQ1: Are United States nursing homes with more minority residents in predominantly minority racial/ethnic counties less likely to have a ventilator dependent unit during the COVID-19 pandemic?

RQ2: Are United States nursing homes with more minority residents in predominantly minority racial/ethnic counties more likely to have higher resident total confirmed COVID-19 cases?

RQ3: Are United States nursing homes with more minority residents in predominantly minority racial/ethnic counties more likely to have higher resident total COVID-19 deaths?

Population and Sample

The population in this study includes United States nursing homes. The study sample included United States nursing homes that reported COVID-19 data to the CMS. Nursing home COVID-19 data included data reported between June 2020 and January 2021. The unit of analysis was the nursing home. After cleaning the data and removing nursing homes that did not report any information to CMS and did not have complete information on key variables, the total number of nursing homes used for the study was 14,405.

Data Sources

The study exclusively involved the use of secondary data from publicly available databases. The study merged data from five publicly available data sources: (a) COVID-19 Nursing Home Data, (b) 2019 County Health Rankings and Roadmaps, (c) CMS Provider of Service Current Files, (d) SNF Provider Information files, and (e) Brown LTC for resident characteristics and acuity.

The COVID-19 Nursing Home Data file is a public file with self-reported data from nursing homes reported to the CDC's National Healthcare Safety Network (NHSN) system COVID-19 Long Term Care Facility Module (*COVID-19 Nursing Home Data*, 2021). The data includes resident characteristics, the facility resident capacity, details on staff and personnel, facility supplies and personal protective equipment, ventilator capacity, and supplies data elements (*COVID-19 Nursing Home Data*, 2021). Data extracted for this research included total residents' confirmed COVID-19 cases and total residents COVID-19 deaths. Nursing homes submitted their data weekly, and it was posted to the public data file. The cut-off date used for this study was January 4, 2021. The data were downloaded and used for analysis in February 2021.

The 2019 County Health Rankings and Roadmaps (CHR&R) is a tool that provides data on counties in the United States. It is a University of Wisconsin Population Health Institute program to build awareness of factors influencing health and creating health equity regardless of race, ethnicity, gender, income, location, or other factors (*County Health Rankings & Roadmaps*, 2021). It illustrates gaps in health outcomes and inequities in opportunities. The CHR&R model extracts data and translates it into accessible models, reports, and products to help understand the factors that make communities healthy and identify needs (*County Health Rankings & Roadmaps*, 2021). In this research, the 2019 County Health Rankings data provided information on the nursing home county's race and ethnicity, allowing for examining nursing home neighborhood racial/ethnic population characteristics in counties throughout the United States. The racial/ethnic populations were measured as either not-majority White population (high minority) or majority White population (low minority). Data obtained and utilized in this study also included the rurality of counties.

CMS Provider of Service Current Files is available to the public on the CMS website. The data are collected through the CMS regional offices, updated quarterly, and posted to the website (*Provider of Services Current Files*, 2021). It compiles data on characteristics of hospitals, skilled nursing facilities, and various types of healthcare facilities. Specific data characteristics include the facility's name and address, type of Medicare services provided, and numerous other facility descriptions (*Provider of Services Current Files*, 2021). Data obtained and utilized in this study included facility location, ownership type, and the number of beds.

SNF provider information files are publicly accessible datasets located on the CMS website. The files provide general information on nursing homes, including the number of certified beds, quality measure scores, staffing information, and information used in the five-star rating system (*Provider Information*, 2021). The datasets allow for the comparison of the quality of care provided in skilled nursing facilities. Data obtained and used in this study included facility location, number of certified beds, quality score measures, and staffing information.

The Brown University Center for Gerontology and Healthcare Research LTCfocus database creates custom reports for long-term care in the United States. Available data includes the health and functional status of nursing home residents, facility characteristics of care, relevant LTC services and financing state policies, and data on market characteristics where the facilities are located (LTCfocus, 2021). The website allows examining care processes and resident outcomes relative to the local market and regulatory practices (LTCfocus, 2021). For this study, the Brown LTC data report for resident characteristics and acuity was used and averaged over 5 years, 2013-2017, to make data more stable to variation.

Dependent Variables

Three dependent variables were assessed in line with the Donabedian model to answer the research questions and test the hypotheses: (a) one process variable and (b) two outcome variables. The first dependent variable (the process variable) was the presence of a ventilator dependent unit within the nursing home facility. The second and third dependent variables were the residents' total confirmed COVID-19 cases and the residents' total COVID-19 deaths in United States nursing homes, respectively. Both COVID-19 outcome variables were assessed in February 2021, when the data were downloaded to be used for analysis.

Key Independent Variable

The key independent variable was the interaction between the nursing home county's racial/ethnic demographic characteristics and the resident's racial/ethnic demographic characteristics. The nursing home county's and resident's racial/ethnic demographic is majority White population (low minority) versus not-majority White population (high minority). This definition was based on the demographic characteristics of the county or nursing home, respectively. Counties or nursing homes were defined as majority White if the percentage of the White population were more than 50%; otherwise, they were classified as non-majority White.

Control Variables

There were several control variables used in the research study. The literature review helped identify control variables to be included in the analysis. The control variables selected were to adjust for factors that might influence nursing homes' patient quality outcomes. Shortage of nursing staff was one of the control variables, assessed as a staffing shortage of registered nurses, practical nurses, or vocational nurses. The nursing home location control variable described if the nursing home was in a rural or urban area. The facility ownership type control variable classified the nursing homes as nonprofit, for-profit, government, or in-hospital. Another control variable was whether or not the nursing home was part of a chain. The 5-year average acuity of the residents in the nursing home was also included as a control variable. The state location of the nursing home was included as a fixed effect in the models to adjust for state policies and requirements variations.

Conceptual Model Application

The study provided a conceptual framework for research on COVID-19 in United States. nursing homes utilizing the Donabedian structure-process-outcome model of healthcare quality. I hypothesized that nursing home structure characteristics in tandem with the established COVID-19 health processes and ventilator-dependent units' availability impacted patient morbidity and mortality. Utilization of this model informs the belief that identifying the factors influencing adverse health COVID-19 outcomes for nursing home residents could help facilitate health quality improvement opportunities.

Tables 1 –3 detail the study variables in the Donabedian Structure-Process-Outcome conceptual framework and identify the variables' data type.

Table 1

Nursing Home COVID-19 Quality of Health Structure Data Description

Variable	Description	Type
Shortage of nursing staff	Indicates if staffing shortage of nursing staff: registered nurse, licensed practical nurse, vocational nurse as reported by the provider	Categorical
Nursing home location	Rural and urban	Categorical

Facility ownership type	Nonprofit, for-profit, government, in-hospital	Categorical
Nursing home county racial/ethnic demographic	Majority White counties and not-majority White counties	Categorical

Table 2

Nursing Home COVID-19 Quality of Health Process Data Description

Variable	Description	Type
Ventilator dependent unit	Indicates if there is a ventilator dependent unit in the facility as reported by the provider available for COVID-19	Categorical

Table 3

Nursing Home COVID-19 Quality of Health Outcome Data Description

Variable	Description	Type
# Residents COVID-19 cases	Number of residents with laboratory positive COVID-19 (confirmed) since 1/1/20 as reported by the provider	Continuous
# Residents COVID-19 deaths	Number of residents with suspected or laboratory positive COVID-19 who died in the facility or another location (COVID-19 deaths) since 1/1/20 as reported by the provider	Continuous

Description of Research Methodology

This research drew from the transformative worldview and posits that research studies should be interwoven with politics and confront social oppression (Creswell, 2018). This position considers marginalized populations, social justice issues, and discrimination and includes various critical theorists, including racial and ethnic minority researchers (Creswell, 2018). Minority populations belong to a traditionally marginalized group in the United States (Bleich et al., 2019). This worldview's research agenda stresses the need to speak to current social issues, confront social oppression and inequality, and reform that will change individuals' jobs, where they live, and institutions (Creswell, 2018). The

transformative worldview application in this study explored minority residents' experiences in United States nursing homes related to COVID-19.

I focused on unearthing potential health disparities by focusing on nursing facilities' process and health outcomes and their correlations with the jointly assessed structural characteristics of whom and where they serve. I utilized a correlational retrospective quantitative research design to show the relationship between the primary independent and dependent variables and provided a statistical description of the results.

Data Analysis

Descriptive statistics were carried out on the data, where appropriate, frequencies, means, medians, and standard deviations were calculated. Pearson's chi-square test and Wilcoxon rank-sum test were conducted to examine group differences. The Pearson's chi-square and Wilcoxon rank-sum tests compared categorical characteristics in majority White and not-majority White counties. In this study, Pearson's chi-squared test was used to test the relationship between categorical variables and assess the homogeneity comparison between majority White counties and not-majority White counties. It was used to determine whether there was a statistically significant difference between the expected frequencies and observed frequencies in the racial/ethnic majority of the counties. The Wilcoxon rank-sum test is a nonparametric statistical test used to compare two groups. Those groups for this study were majority White counties and not-majority White counties. It was used to assess whether the distribution of observations obtained between majority White counties and not-majority White counties was systematically different.

Firth logistic regression analysis was used to examine the association of the key independent variable, the interaction between nursing home countries' and residents' majority racial/ethnic demographic characteristics, with the dichotomous dependent variable of ventilator unit for COVID-19. A nursing home will either have a ventilator dependent unit during COVID-19 or will not have a ventilator dependent unit during COVID-19. The absence or presence of a ventilator dependent unit allows for examining the differences in the availability of ventilators during the COVID-19 pandemic by a county's

majority racial/ethnic demographic. The dependent variable, a ventilator dependent unit during COVID-19, was a binary variable, yes or no, making a logistic regression appropriate. Ventilator-dependent units are generally not common across United States nursing homes. Thus, firth logistics regression was appropriate because it is a classification algorithm used to find the probability of a rare event. The firth logistics regression in this research measures the probability of nursing homes having ventilator dependent units available based on the nursing home and county's racial/ethnic demographic composition. The resulting co-efficient were exponentiated to calculate the odds ratio for easy interpretation.

The zero-inflated negative binomial (zinb) regression is an approach for modeling count variables with excessive zeros. Compared to Poisson regression, zinb performs better when modeling with overdispersion outcome variables. Zinb has two parts consisting of: (a) a logit component (zero outcomes) and (b) a negative binomial process that models the count. For ease of interpretation, the incidence relative risk (IRR) was calculated by exponentiating the coefficients of the negative binomial process. Results from the zero-inflated component of the results were suppressed for reporting purposes since that was not the focus of the study.

For this study, zinb was used to examine how the key independent variable, the interaction between county and resident racial/ethnic demographic composition, influenced the dependent variables', confirmed COVID-19 cases, and COVID-19 deaths. A Vuong test was conducted to test the appropriateness of the zero-inflated negative binomial model for these two hypotheses. The results of the Vuong tests suggested that the zero-inflated negative binomial regressions were a better fit compared to the regular negative binomial models.

The results from the data analyses were reported in tables, and statistical significance was assessed at $p<.05$. The statistical software used for all data analysis was Stata version 16.

Expected Impact and Significance of Study

I examined the relationship between nursing homes with more minority residents in predominantly minority racial/ethnic counties and the COVID-19 related processes and outcomes. This

study adds to the body of research and may guide future studies examining equity-related issues in nursing homes with high minority residents in predominantly minority racial/ethnic counties.

Ethical Considerations

The datasets were obtained from publicly available websites and did not disclose identifying or confidential information. After submitting the dissertation project description to Georgia Southern University's Institutional Review Board (IRB), research was deemed exempt, and approval was granted. Secondary data usage exempts this research from human subjects' IRB requirements.

Limitations

There were noteworthy methodological limitations to this study. First, the analysis was cross-sectional, and thus causality cannot be established. Further, important confounding factors may have been excluded from the study's assessment. The COVID-19 data used were obtained between June 2020 and January 2021. However, the COVID-19 pandemic was still ongoing (Sugg et al., 2020). It is possible that the impact of the nursing home characteristics on resident outcomes may not be static but instead dynamic and evolving as the pandemic evolves. Finally, secondary data, including data from administrative sources were used, which may have contained errors.

Summary of Chapter

I aimed to identify and describe the interaction between nursing home residents' racial/ethnic minority racial composition and between nursing home counties' overall racial/ethnic demographics and the health outcomes of COVID-19 morbidity and mortality. I utilized a cross-section approach using secondary data on COVID-19 nursing home cases and deaths from June 2020 through January 2021. The benefit of secondary data included availability, savings in cost and time, and an efficient method of achieving a large sample size. In addition, the correlational retrospective design of this study permitted an examination of the relationship between independent and dependent variables using statistical data to identify trends and patterns in the data. This design's strength was that it prevents ethical manipulation of participants or characteristics of the nursing facility.

Chapter 3 explained the research design, data collection methods, population and sample, and limitations. This quantitative study design examined the relationships between nursing home COVID-19 outcomes and the interaction of nursing homes with more minorities and the nursing home countys' predominant racial/ethnic population. The research unit of study was licensed nursing homes in the United States, focusing on 14,405 nursing homes between June 2020 and January 2021. The methodological objective provided a framework for examining future COVID-19 cases and deaths in high minority nursing homes and the relationship of county racial/ethnic demographic variables in disease transmission and outbreaks (Sugg et al., 2020). Chapter 4 explores the statistical results of this study.

CHAPTER 4

RESULTS

Introduction

This chapter presents the research findings of the quantitative analysis of the moderating effect of county racial composition on the relationship between United States nursing home residents' racial composition and COVID-19 cases and deaths during the COVID-19 pandemic. The research results address a critical gap in studies of disparities in COVID-19 health outcomes.

Results

Descriptive Statistics

The descriptive statistics of variables included in this study are presented in Table 4.

Facility Characteristics. The study sample consisted of 14,405 nursing homes across the United States that reported COVID-19 data to the CDC. Of those nursing homes included in the study, 11,222 were in the majority White counties, and 3,183 were in not-majority White counties. 7,438 (66.3%) of the nursing homes in majority White counties were in urban areas, compared with 2,882 (90.5%) nursing homes in not-majority White counties. Facility ownership type for nursing homes in the majority White counties included 7,633 (68.0%) for-profit, 753 (6.7%) government, and 2,836 (25.3%) nonprofits. In comparison, the facility ownership type in not-majority White counties included 2,484 (78.0%) for-profit, 141 (4.4%) government, and 558 (17.5%) nonprofits. Of those nursing homes in majority White counties, 6,644 (60%) were part of a chain. In comparison, 1,714 (53.8%) of those in not-majority White counties were part of a chain. In the majority White counties, the distribution of nursing home beds was as follows: (a) the nursing homes with up to 100 beds include 6,034 (53.8%) nursing homes and (b) those with more than 100 beds, 5,188 (46.2%). Conversely, there were 1,390 (43.7%) nursing homes in not-majority White counties with a facility size up to 100 beds and 1,793 (56.3%) with more than 100 beds. The average number of residents per day in majority White counties was mean (SD) 73 (41), versus 88 (57) in not-majority White counties.

County Characteristics. The mean (SD) percent of the population that was 65 years and older for the majority White counties was 17.8% (4) compared to 13.7% (2.2) in not-majority White counties. The mean (SD) percent of the population unemployed for the majority White counties was 4.3% (1.1) compared to 4.9% (1.5) in not-majority White counties. The mean (SD) percentage of the population that is female was 50.6% (1.4) in majority White counties and 50.7% (1.5) in not-majority White counties.

Quality. Of the nursing homes located in the majority White counties, 2,053 (20%) experienced a shortage of nursing staff, and 310 (3%) experienced a shortage of clinical staff. In the nursing homes located in not- majority White counties, 310 (10%) experienced a shortage of nursing staff, and 52 (1.7%) experienced a shortage of clinical staff. The mean (SD) number of total staff confirmed COVID-19 cases in majority White counties was 34 (24) and in not-majority White counties was 39 (27). The number of nursing homes in majority White counties with a ventilator dependent unit was 282 (2.8%), and the number in not-majority White counties was 225 (7.6%). The overall quality rating ranges from 1 to 5, with 1 being the lowest and 5 the highest. The distribution of the overall quality rating in majority White counties were as follows: (a) rating 1 was 1,625 (15%), (b) rating 2 was 2,115 (19%), (c) rating 3 was 2,034 (18%), (d) rating 4 was 2,492 (22%), and (e) rating 5 was 2,895 (26%). The distribution for the overall quality rating in not-majority White counties were as follows: (a) rating 1 was 468 (15%), (b) rating 2 was 617 (20%), (c) rating 3 was 592 (1%), (d) rating 4 was 647 (20%), and (e) rating 5 was 893 (27%).

Resident Characteristics. In the majority White counties, 10,792 (97%) of the nursing home residents were majority White, and 390 (3.5%) were not-majority White residents. In the not-majority White counties, 1,822 (59%) of the nursing home residents were majority White, and 1,281 (41%) were not-majority White. The mean acuity level among nursing home residents (SD) in majority White counties was 12 (1.1) and in not-majority White counties 12.7 (1.7).

COVID-19 Outcomes. The mean (SD) number of total residents confirmed COVID-19 cases in nursing homes located in majority White counties were 40 (34) cases per 1,000 residents. In the not-majority White counties, the mean (SD) resident total confirmed COVID-19 cases were 45 (37) cases per

1,000 residents. Additionally, in the majority White counties, the mean (SD) number of resident COVID-19 deaths was 8 (10) cases per 1,000 residents. In comparison, the mean (SD) COVID-19 resident deaths in nursing homes in the not-majority White counties was 8 (11) cases per 1,000 residents.

Table 4

Descriptive Statistics

Characteristic	Majority White countries, N = 12,222	Net Majority White countries, N = 3,183	p-value[1]
Ventilator dependent unit			<.001
No	9,925 (97%)	2,729 (92%)	
Yes	282 (2.8%)	225 (7.6%)	
Shortage of nursing staff			<.001
No	8,358 (80%)	2,684 (90%)	
Yes	2,053 (20%)	301 (10%)	
Residents total confirmed COVID-19			<.001
Mean (SD)	40 (34%)	45 (37%)	
Residents total COVID-19 deaths			.28
Mean (SD)	8 (10%)	8 (11%)	
Shortage of clinical staff			<.001
No	10,101 (97%)	2,933 (98%)	
Yes	310 (3%)	52 (1.7%)	
Overall rating			.28
1	1,625 (15%)	468 (15%)	
2	2,115 (19%)	617 (20%)	
3	2,034 (18%)	592 (19%)	
4	2,492 (22%)	647 (20%)	
5	2,895 (26%)	839 (27%)	
Facility size			<.001
More than 100	5,188 (46%)	1,793 (56%)	
Up to 100	6,034 (54%)	1,390 (44%)	
Ownership type			<.001
For profit	7,633 (68%)	2,484 (78%)	
Government	753 (6.7%)	141 (4.4%)	
Nonprofit	2,836 (25%)	558 (18%)	
Average number of residents per day			<.001
Mean (SD)	73 (41%)	88 (57%)	
Rural/urban			<.001
Rural	3,784 (34%)	301 (9.5%)	
Urban	7,438 (66%)	2,882 (91%)	
Percent of population 65 years and older			<.001
Mean (SD)	17.8 (4%)	13.7 (2.2%)	
Percent of population unemployed			<.001
Mean (SD)	4.3 (1.1%)	4.94 (1.5%)	
Residents			<.001
Majority White	10,792 (97%)	1,822 (59%)	
Not majority White	390 (3.5%)	1,281 (41%)	
Percent of populations that are female			
Mean (SD)	50.58 (1.43%)	50.87 (1.46%)	
Mean acuity			<.001
Mean (SD)	12 (1.14%)	12.66 (1.66%)	
Part of a chain	6,644 (60%)	1,714 (54%)	<.001
Staff total confirmed COVID-19			<.001
Mean (SD)	34 (24%)	39 (27%)	

Note. 1 Pearson's chi-squared test; Wilcoxon rank sum test.

Firth Logistics Regression: Ventilator dependent Unit

As seen in Table 5, a firth logistics regression analysis was conducted to investigate the moderating role of county racial/ethnic composition on the relationship between the nursing home residents' racial/ethnic composition and the presence of ventilator dependent units during COVID-19. The main predictor variable was the interaction between county's and nursing home's racial/ethnic demographic composition, and the dependent variable was the presence of a ventilator dependent unit.

Nursing home residents' racial/ethnic composition was associated with the presence of a ventilator dependent unit, with nursing homes with predominantly (not-majority White) minority residents almost twice as likely to have a ventilator dependent unit (O.R. = 1.94; $p<.05$), compared to nursing homes with majority White residents. Neither the racial/ethnic composition of the county nor the interaction term between the county's and nursing home's racial/ethnic demographic composition was associated with the presence of a ventilator-dependent unit. Thus, hypothesis 1 was not supported.

Compared to for-profit ownership type, nonprofit nursing facilities were 40% less likely to have a ventilator dependent unit (O.R = .6; $p<.05$). Smaller facilities (i.e., facility size up to 100 beds) were less likely to have a ventilator dependent unit (O.R. = .51; $p<.01$). Nursing home quality was also negatively associated with a ventilator-dependent unit, with the odds of having a ventilator-dependent unit decreasing with increasing quality rating. On the other hand, nursing homes with a higher average number of residents per day were more likely to have a ventilator dependent unit (O.R. = 1.01; $p<.01$). Similarly, nursing homes with higher resident mean acuity were more almost 5 times likely to have a ventilator dependent unit (O.R. = 4.66; $p<.01$). All other assessed factors were not associated with the presence of a ventilator dependent unit.

Table 5

Firth Logistic Regression

Dependent variable	Ventilator dependent unit
Ownership type (Ref=for profit)	
Government	.666 (.289)
Nonprofit	.595** (.17)
Average number of residents per day	1.008*** (.001)
Location (Ref=Rural)	
Urban	1.38 (.198)
Percent of population 65 years and older	1.035 (.025)
Percent of population unemployed	.968 (.055)
Mean acuity	4.658*** (.066)
Facility size (Ref = More than 100 beds)	
Up to 100 beds	.506*** (.151)
Percent of population that are female	.945 (.057)
Counties (Ref= Majority White)	
Not majority White counties	.96 (.238)
Residents (Ref= Majority White)	
Not majority White residents	1.944**(.244)
Overall rating (Ref= 1)	
2	.713* (.172)
3	.634* (.18)
4	.589** (.183)
5	.474***(.191)
Part of a chain (Ref= No)	
Yes	.978 (.126)
Interaction (Ref= Majority White residents in majority White counties)	
Not majority White residents in not majority White counties	.723 (.314)
Constant	0*** (1.243)

Note. *p<.1; **p<.05; ***p<.01

Zero-inflated Negative Binomial Regression: Residents Total Number of Confirmed COVID-19 Cases

A zero-inflated negative binomial regression analysis was conducted to investigate the moderating role of county racial/ethnic composition on the relationship between the nursing home residents' racial/ethnic composition and the total number of confirmed COVID-19 cases. The results in Table 6 model the total number of confirmed cases of COVID-19 against factors that were assumed to impact the incidence rate.

The racial composition of the nursing home county location was associated with COVID-19 cases. Conditioned on reporting at least one COVID-19 case, COVID-19 cases were fewer in nursing homes located in not majority (i.e., minority) White counties (IRR=.87; $p<.01$). Compared with nursing homes with majority White residents, nursing homes with residents who were not majority White reported a lower number of COVID-19 cases (IRR=.89; $p<.01$). The interaction term between the county's and nursing home's racial/ethnic demographic composition was not associated with COVID-19 cases. Thus, hypothesis 2 was not supported.

Compared to for-profit ownership type, being a government-owned nursing facility (IRR=.83; $p<.01$) or nonprofit facility (IRR=.81; $p<.01$) was associated with a decrease in total confirmed COVID-19 cases. Similarly, an increase in the percent of population 65 years and older (IRR=.995; $p<.05$), facilities with bed sizes up 100 beds compared to more than 100 beds (IRR=.77; $p<.01$), overall rating of 5 compared to 1 (IRR=.89; $p<.01$) and presence of a ventilator dependent unit (IRR=.69; $p<.01$) were all associated with a decrease in COVID-19 confirmed cases.

Factors that increased the chances of higher residents total confirmed COVID-19 cases included higher average number of residents per day (IRR=1.01; $p<.01$), percent of the population unemployed (IRR=1.03; $p<.01$), higher mean acuity (IRR=1.07; $p<.01$).

Zero-inflated Negative Binomial Regression: Residents Total Number of COVID-19 Deaths

Similarly, a zero-inflated negative binomial (zinb) regression analysis was conducted to investigate the moderating role of county racial/ethnic composition on the relationship between the nursing home residents' racial/ethnic composition and the total number of COVID-19 deaths. The results in Table 6 model the residents' total number of COVID-19 deaths against factors assumed to impact the death rate.

The racial composition of the nursing home county location was correlated with COVID-19 deaths. Conditioned on reporting at least one COVID-19 death, COVID-19 deaths were fewer in nursing homes located in not majority (i.e., minority) White counties (IRR=.9; $p<.01$). Compared with nursing homes with majority White residents, nursing homes with residents who were not majority White

reported a lower number of COVID-19 deaths (IRR=.82; $p<.01$). The interaction term between the county's and nursing home's racial/ethnic demographic composition was also associated with COVID-19 deaths (IRR=1.2; $p<.01$). Specifically, the risk of COVID-19 deaths was found to be 20% higher in nursing homes with predominantly minority residents located in minority counties. Thus, hypothesis 3 was supported.

Compared to for-profit ownership type, government-owned nursing facilities (IRR=.87; $p<.01$) and nonprofit (IRR=.91; $p<.01$) had a lower chance of higher residents total COVID-19 deaths. Also, smaller facilities of up to 100 beds (IRR=.77; $p<.01$), facilities with an overall rating of 5 (IRR=.9; $p<.01$) compared to 1, and facilities with a ventilator dependent unit (IRR=0.66; $p<.01$) decreased the chance of higher residents total COVID-19 deaths.

Factors such as an increase in the average number of residents per day (IRR=1.01; $p<.01$), percent of the population unemployed (b=1.03; $p<.01$), mean acuity (b=1.07; $p<.01$) increased the chance of higher residents total COVID-19 deaths. To be sure this model was better than a regular negative binomial model, a negative binomial model was subsequently run and compared with the zinb using the Vuong test. The results of the Vuong test suggest that the zinbs were a better fit compared to the regular negative binomial models.

Table 6

Zero-Inflated Negative Binomial Regression

Dependent variable	Residents' total confirmed COVID-19 cases	Residents' total COVID-19 deaths
Ownership type (Ref= For-profit)		
Government	.827 [-5.976***]	.867 [-3.416***]
Nonprofit	.811 [-11.555***]	.914 [-3.771***]
Average number of residents per day	1.008 [32.895***]	1.006 [20.147***]
Location [Ref= Rural]		
Urban	.994 [-.295]	1.026 [-.96]
Percent of population 65 years and older	.995 [-2.289**]	.994 [-1.974**]
Percent of population unemployed	1.027 [3.639***]	1.029 [3.009***]
Mean acuity	1.035 [4.526**]	1.069 [5.848***]
Facility size (Ref= More than 100 beds)		
Up to 100 beds	.774 [-13.856***]	.768 [-11.126***]
Percent of population that are female	.993 [-1.319]	.998 [-.233]
Counties (Ref= Majority White)		
Not majority White counties	.874 [-4.923***]	.9 [-2.995***]
Overall rating (Ref= 1_		
2	.997 [-.095]	1 [-.005]
3	1.01 [.423]	1.01 [.313]
4	.971 [-1.264]	.966 [-1.124]
5	.89 [-4.911]	.901 [-3.339***]
Part of a chain (Ref= No)		
Yes	1.071 [4.59***]	1.008 [.412]
Ventilator dependent unit (Ref= No)		
Yes	.693 [-9.588***]	.657 [-8.315]
Interaction		
Ref= Majority White residents in majority White counties)	1.052 [.984]	1.198 [2.671***]
Constant	16.925 [21.121***]	2.404 [4.423***]

Note. *p<.1; **p<.05; ***p<.01

Summary

In summary, the firth logistics regression and zero-inflated negative binomial regression techniques were chosen to analyze the data to test the study's hypotheses. One out of the 3 hypotheses was supported. The risk of COVID-19 death was found to be higher in nursing homes with predominantly minority residents located in minority counties. Chapter 5 discusses the summary of research findings, public health implications, and recommendations for future research.

CHAPTER 5

DISCUSSION

Introduction

In March 2020, the WHO declared COVID-19) as the most severe public health emergency in over a century (Afifi, 2020; Louis-Jean et al., 2020; Nair et al., 2020). It began in Wuhan, China, in December 2019 and quickly spread to almost all countries by April 2020 (Kannan, 2020; Nair et al., 2020). COVID-19 is a severe respiratory virus transmitted from the respiratory droplets and the inhalation of viral particles from an infected person and close contact with individuals positive for COVID-19 (Dean et al., 2020; Kannan, 2020; Louis-Jean et al., 2020; Nair et al., 2020; L. Wang et al., 2020). It is highly contagious, and the symptoms range from asymptomatic to symptomatic with moderate symptoms to severe symptoms causing hospitalization, intensive care, use of a ventilator, and death (Kannan, 2020; Nair et al., 2020; *Nursing Homes & Long-Term Care Facilities*, 2020; L. Wang et al., 2020). COVID-19 cases and deaths were most significant in vulnerable populations and magnified existing health disparities (Flatharta, 2020; He et al., 2020; Holtgrave et al., 2020; Krishnan et al., 2020). The congregate nature and the resident population of nursing homes increased the risk of COVID-19 transmission and mortality among residents. As a result, nursing homes in the United States became the epicenter of the virus (Dean et al., 2020; He et al., 2020).

The problem is that the coronavirus pandemic negatively impacted nursing home patient outcomes, especially for minority residents who experienced adverse outcomes at increased rates (Farley et al., 2020; He et al., 2020). A disproportionate number of nursing homes were impacted by COVID-19 cases, resulting in one-third of the deaths in the United States (Abrams, 2020; Gorges & Konetzka, 2020; Szczerbinska, 2020). Epidemiological data gathered from across the United States indicated a disparity in COVID-19 morbidity and mortality rates among vulnerable populations (Abedi et al., 2020). The disproportionate impact was most significant among the elderly and the Black populations, with higher transmission and death rates (Abedi et al., 2020; Afifi, 2020; Coughlin, 2020; Dean et al., 2020). The research was necessary to understand what contributed to this disproportionality and propose solutions to

address the disparity impacting minority residents in nursing homes (Campbell et al., 2016; Fiscella &

Sanders, 2016; Grabowski & McGuire, 2009).

The purpose of this research study was to use Avedis Donabedian's quality of care model to

examine the interactive effects of nursing home residents and county location's racial/ethnic composition

on COVID-19 morbidity and mortality in United States nursing homes. The key independent variable in

this study was the interaction between the nursing home county's racial/ethnic demographic

characteristics and the nursing home resident's racial/ethnic demographic characteristics. The primary

market was defined as the county in which the nursing home was located. The dependent variables

included in the study were: (a) nursing home having a ventilator dependent unit for COVID-19, (b) the

total number of confirmed COVID-19 cases, and (c) the total number of COVID-19 deaths.

Understanding the interaction between the nursing facility county racial/ethnic demographic

characteristics and resident racial/ethnic demographic characteristics relationship presents an opportunity

to assess potential health inequity with COVID-19 outcomes.

Summary of Research Results

I aimed to explore three focal relations in United States nursing homes during the COVID-19

pandemic. The first relationship was the association between a nursing home with more minority

residents in predominantly minority racial/ethnic counties and the presence or absence of ventilator

dependent units. The second and third relationships focused on the correlations between nursing homes

with more minority residents in predominant minority racial/ethnic counties and nursing home residents

total confirmed COVID-19 cases and resident total COVID-19 deaths respectively. I sought to identify

inequity between nursing homes and answer the following research questions:

RQ1: Are United States nursing homes with more minority residents in predominantly minority

racial/ethnic counties less likely to have a ventilator dependent unit during the COVID-19 pandemic?

RQ2: Are United States nursing homes with more minority residents in predominantly minority

racial/ethnic counties more likely to have higher resident total confirmed COVID-19 cases?

RQ3: Are United States nursing homes with more minority residents in predominantly minority racial/ethnic counties more likely to have higher resident total COVID-19 deaths?

The results of this study did not find disparities in nursing home availability of ventilator dependent units. The pandemic created a demand for ventilators in the United States and worldwide, creating a shortage (White & Lo, 2020). Consequently, the allocation was scarce for all nursing homes, thus explaining the similarity in outcomes in the interactions of nursing homes located in minority counties and those in majority White counties (White & Lo, 2020). Similarly, there was a lack of statistically significant difference in the number of confirmed COVID-19 cases between nursing homes in majority White counties and not majority White counties, contrary to previous studies that have found that predominantly minority counties presented the highest risk of COVID-19 infection for nursing home residents (Chatterjee et al., 2020; Coughlin, 2020). This discrepancy may be explained by the differences in the timing of the study. This present study included data between June 2020 and January 2021, a period that extended beyond the earlier waves of the pandemic when nursing homes were hit the hardest. Thus, it is possible that observed geographic and racial-related disparities among nursing homes during the earlier phase of the pandemic diminished over time as nursing homes became better equipped to deal with the pandemic and regulatory enforcements standardized infection control and COVID-19 mitigation efforts across nursing homes nationwide.

Overall, older adults, minorities, and those residing in nursing homes were disproportionately impacted by the COVID-19 virus (Li, Temkin-Greener, et al., 2020; Sugg et al., 2020). However, I did not find a moderating role of the racial mix of the nursing home's location on the relationship between resident's racial mix and COVID-19 cases but demonstrated a statistically significant positive association with COVID-19 deaths among minority residents in predominantly minority racial/ethnic counties. Factors related to adherence to infection control processes across all nursing homes support the lack of statistical significance between nursing home county locations and resident COVID-19 cases (Lipsitz et al., 2020). However, the findings suggest that once COVID-19 infection occurred, inequities in disease outcomes existed. This finding corroborates prior studies that have reported higher rates of COVID-19

mortality in nursing homes in predominantly minority counties (Kumar et al., 2021; Li, Temkin-Greener, et al., 2020; Lopez et al., 2021).

Research Conclusions

Disparities in COVID-19 Outcomes

Previous studies have not examined the interactive effect of nursing homes' resident racial composition and that of the county within which they are located with COVID-19 morbidity and mortality outcomes. I found that despite strict, coordinated, and generally standardized efforts to mitigate the spread of COVID-19 within nursing homes, racial disparities in disease outcomes persisted, pointing to persistent disparities in access to quality health services. Within the last 100 years, two other pandemics have also disproportionately impacted minority populations, the 1918 flu pandemic and the 2009 H1N1 pandemic. The mortality impact of the 1918 flu pandemic revealed a geographic variation in health outcomes associated with socioeconomic factors (Calderon-Larranaga, 2020). The 1918 flu pandemic also highlighted existing racial disparities and minority distrust of the healthcare system (Louis-Jean et al., 2020). Because response efforts and resources were exclusive to the White community, Black communities relied on limited resources, inadequate medical care, and racially segregated medical facilities (Louis-Jean et al., 2020).

During the 2009 H1N1 influenza pandemic, communities with a high minority concentration were less likely to be vaccinated and had limited access to personal preventative measures (Strully, 2011). The Black elderly population experienced the greatest disparity with the highest H1N1 influenza mortality rates in the United States (Strully, 2011). In high minority nursing homes, disparities in infectious disease were thought to be related to individual and organizational factors including: (a) history of medical distrust leading to vaccine refusal, (b) concentration disadvantage of an overrepresented population of unvaccinated residents, and (c) resident racial composition impacting the quality of care in the facility (Strully, 2011). Similar to the H1N1 influenza pandemic, minority populations were disproportionately impacted by COVID-19, experiencing disparities in severity, and disease mortality (Abedi et al., 2020).

The patterns of inequity in the United States for vulnerable populations that emerged from the 1918 flu pandemic, the 2009 H1N1 influenza pandemic, and the COVID-19 pandemic supports the necessity for change that will bring about health equity (Krishnan et al., 2020). A strategy is necessary to prepare, educate, and respond to future public health emergencies while reducing disparities in marginalized communities (Krishnan et al., 2020). The strategy will require sustained advocacy that equips public health and community partners and informs federal response strategies that can be augmented to protect vulnerable populations and communities (Morgan & Reid, 2020). Development of the strategy will require acknowledgment of the patterns of socioeconomic, health, and race/ethnic disparities (Louis-Jean et al., 2020). Because vulnerable populations were inequitably impacted, the needs of this group must be prioritized in developing relief programs (Sharifi & Khavarian-Garmsir, 2020). The strategies will require targeted interventions considering the race/ethnic mix of the community, the race/ethnic mix of nursing facilities, access to testing, quality healthcare, appropriate medical treatment, and viable resources (Abedi et al., 2020; Louis-Jean et al., 2020). Once strategies are developed, they must be finalized with policy, practice, and funding (Morgan & Reid, 2020).

Research Limitations

There were multiple limitations in this research study. The study was limited to United States skilled nursing facilities, with a limited study scope between June 2020 and January 2021. Preliminary COVID-19 reporting data were limited due to the absence of reporting requirements. This study involved the use of secondary data from publicly available databases. Additionally, CMS did not require nursing facilities to report COVID-19 cases and deaths by race/ethnicity. Facility-level resident race/ethnicity data were gathered from the Brown School of Public Health's long-term care database. Coupled with the research design, these factors placed some limitations on the study, particularly regarding the generalizability and stability of the findings.

First, the generalizability of the results was limited, as the sample size was limited to nursing homes and excluded other healthcare congregate settings such as hospitals and assisted living facilities. Unlike other long-term care facilities, nursing facilities have the availability of medical equipment.

Additionally, assisted living facilities do not have the volume of nursing staff available in nursing facilities. Another factor that limits the generalizability is the differences in the physical plant of the healthcare facilities. The layout of a healthcare facility either supports or prevents creating a separate area for a COVID-19 ventilator dependent unit.

Second, the limited availability of complete COVID-19 data covering the pandemic's entirety may have impacted the broad applicability of the findings. For this research, the study scope was limited to June 2020 through January 2021. Because the etiology of COVID-19 was ongoing at the time of the study, the data on COVID-19 was constantly expanding (Sugg et al., 2020). Information on the transmission of the virus and the resources available for mitigation was continually changing (Binder et al., 2020). To gain an accurate understanding of the impact of the pandemic among minority populations, all levels of government (local, state, and federal) must collect and release data classified by race/ethnicity on confirmed COVID-19 cases and deaths (Garcia et al., 2020). Individual-level nursing home resident data for COVID-19 cases and death are needed (Sugg et al., 2020).

A third limitation was secondary administrative data used may have been prone to data reporting errors. These errors include misclassification and incompleteness of data (Kolossvary et al., 2020). Administrative data rely on the reporting organizations to compile and report data accurately and consistently (Gray et al., 2021). With COVID-19, the data are self-reported by the nursing facilities and are void of a verification system to ensure accuracy in reporting. While administrative data are an inexpensive data collection option, they have limited generalizability for specific health outcomes (Gray et al., 2021).

Despite these limitations, this study adds to the growing body of work targeted at characterizing the impact of the pandemic on vulnerable populations, such as minority nursing home residents. The novel coronavirus 2019 was declared a pandemic in March 2020, and the research study period began in June 2020 when CMS started collecting complete data from nursing homes on COVID-19. Before June 2020, the data reporting was voluntary and not complete. The evolving nature of the coronavirus pandemic resulted in continuous additions to the body of literature on the topic. As the pandemic evolves,

new research will be essential to understand the disparities in COVID-19 cases and deaths in United States nursing homes and the factors characterizing the disparities (Sugg et al., 2020).

Public Health Implications

The COVID-19 pandemic is a serious public health challenge that has important implications for minorities in nursing homes in minority counties. While nursing home residents were a small fraction of the United States population at 1%, they accounted for nearly 40% of the COVID-19 deaths (Chen et al., 2020; Gorges & Konetzka, 2021). I found that residents of nursing homes in predominantly minority counties with a high minority racial/ethnic mix were at a higher risk of COVID-19 deaths. Historically, minorities, including Blacks, have been disproportionately concentrated in low-quality nursing homes and have worse outcomes (Chisholm et al., 2013; Gorges & Konetzka, 2021; Li, Temkin-Greener, et al., 2020). Deliberate efforts must be taken to address the unique infection control needs of COVID-19 to achieve health equity for residents in nursing homes (Abrams, 2020).

Policy awareness and initiatives should be put into place to address this history of inequity (Dannefer, 2018). Public health interventions, health policy strategies, and adequate resources could help alleviate the intensity of morbidity and mortality impact of COVID-19 (Ouslander & Grabowski, 2020). The gaps in care and lessons learned from this pandemic create an opportunity to advance equity in LTC facilities and protect vulnerable populations (Ouslander & Grabowski, 2020; T. P. Shippee, O. Akosionu, et al., 2020). Addressing the racial/ethnic disparities of COVID-19 will require understanding the upstream determinants, policymakers sharing the data, and learning about system-level issues that drive racial/ethnic inequity in LTC (Holtgrave et al., 2020; T. P. Shippee, O. Akosionu, et al., 2020).

Recommendations for Future Research and Practice

The importance of studying health equity data about minority nursing home residents' health outcomes during the COVID-19 pandemic stems from the history of healthcare disparities among minority racial/ethnic populations in the United States (Grabowski & McGuire, 2009). This research highlights critical issues for future public health research and practice. First, individual-level data of COVID-19 cases and deaths in nursing homes are needed to understand the factors disproportionately

impacting COVID-19 health outcomes and minority racial/ethnic populations' mortality rates (Gorges & Konetzka, 2021; Kumar et al., 2021). Second, targeted emergency response efforts are needed to establish processes for preventing and controlling future infectious disease outbreaks for vulnerable populations with increased health disparities. Additionally, as the COVID-19 crisis continues, prevention and mitigation efforts must prioritize vulnerable populations to mitigate disparities and health inequities (Abrams, 2020; Afifi, 2020; Kumar et al., 2021; Sugg et al., 2020). The effectiveness of those mitigation and intervention efforts must demonstrate measurable reduction in COVID-19 health outcome disparities for minority nursing home residents in minority counties.

Conclusion

The history of healthcare, racial/ethnic, and socioeconomic inequalities in the United States were magnified in the COVID-19 health outcomes for minority populations in nursing homes (Krishnan et al., 2020; Sharifi & Khavarian-Garmsir, 2020). I found that residents of nursing homes with a high minority resident population experience worse health outcomes, notably deaths, related to COVID-19 than those with a majority White population (Gorges & Konetzka, 2021). Understanding the factors that impact minority racial/ethnic health disparities is vital to creating equity in nursing facilities (Gorges & Konetzka, 2021). It is paramount for COVID-19 prevention and mitigation efforts to prioritize the socially vulnerable to confront health inequities (Afifi, 2020). This research highlights the need to ensure resources are available to protect vulnerable populations, and the factors specific to minority populations are considered when developing prevention measures and responding to COVID-19 outbreaks in nursing homes (Abrams, 2020).

The disparities in COVID-19 health outcomes and the lives lost during the COVID-19 pandemic should not be dismissed. Post-pandemic nursing homes must maintain vigilance with infection prevention and control procedures, ongoing staff education, and enhancement of emergency preparedness plans (Ouslander & Grabowski, 2020). Research post-pandemic must include analyzing nursing home outbreak characteristics and address the disparities experienced by minority populations (Abrams, 2020; Afifi, 2020). Future research must investigate the factors contributing to preventing and mitigating COVID-19

and other infectious disease outbreaks among nursing home residents, especially minority populations located in minority communities. The social determinants of health, underlying health conditions of minority populations, and minority mistrust of the healthcare system must not be overlooked when developing solutions to address health outcome disparities (DeVoe et al., 2016; Krishnan et al., 2020). Health policy research must address the diversity of nursing home populations, develop policies and regulations that address the health disparities of COVID-19, and create a path toward equity and recovery (Krishnan et al., 2020; Laurencin & McClinton, 2020; Ouslander & Grabowski, 2020). Over a century after the 1918 flu pandemic, the COVID-19 pandemic reminds us that unresolved structural inequities will continue to contribute to disparate health outcomes for minority populations and marginalized communities (Krishnan et al., 2020; Louis-Jean et al., 2020).

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