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Analyzing Regional Impact of Caregiving on Obesity Prevalence Among U.S. Adults

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Abstract

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by

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MSSW, University of Tennessee, 1987

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Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Obesity remains one of the leading causes of morbidity and mortality in the United States. Historically, sparse research efforts have focused on informal caregiving as a possible risk factor for developing chronic illnesses across the United States. Identifying additional subgroups at higher risk of becoming obese could provide insights into where public health practitioners, the health care community, and policy makers can direct limited resources through a more targeted approach. The theoretical foundation for the current project was the social cognitive theory. In this secondary correlational analysis using the 2018 Behavioral Risk Factor Surveillance System data set, the relationship between caregiver status, length of time as a caregiver, and obesity status was examined using descriptive statistics, chi-square test of association, and logistic regression analysis. The final population for the study included all respondents who participated in the 2018 BRFSS survey in the three states of Georgia, New Jersey, and Oregon where caregiver questions were asked ($N = 18,341$). The results indicated a weak association between informal caregiving and being overweight/obese. This study focused on the role of informal caregiving and obesity prevalence, thereby identifying another subset of the population that may be at potential risk for developing adiposity. Findings may be used by health professionals to promote self-care in caregivers leading to positive social change.

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Dedication

I would like to dedicate this research project to my dear, sweet, and amazing

fiancé, Leo Wyatt, Jr., who is the sole reason I had the confidence to pursue a doctoral

degree in public health (DrPH). With his gentle prodding, loving-kindness, support, and

belief in my abilities, as well as all of the very practical ways he supported my children

and me, I have successfully reached the finish line and plan to pay forward all of the

kindnesses that he has bestowed upon me over the past 18 years while I continued to

pursue personal and professional goals in the midst of providing care and guidance for

my three children.

Speaking of children, I am so incredibly grateful to my 3 children, James, Molly,

and Abby, for their constant love, support, and encouragement during the past four plus

years. Even as each of them was beginning their college and work careers, they were and

continue to be my greatest cheerleaders. I am so appreciative of their inspiring texts, their

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families we have been blessed to serve and to my Little Church on the Lane/Peace

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to each of you for helping to keep the organization vibrant and strong and for continually

reminding me of why this doctoral degree was so important to finish so that together we

can continue to impact our local communities in meaningful ways.

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While mere words will never be adequate to express my gratitude, I know I am divinely blessed to be surrounded by unbelievable individuals who strive to do good in the world and to leave every place they live, work, and play just a little better than before! I am looking forward to our continued collective journey together!

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Section 1: Foundation of the Study and Literature Review

Obesity continues to increase both across the United States and the globe (Centers for Disease Control and Prevention [CDC], 2019; Livingston, 2018). Numerous risk factors have been identified through previous evidence-based research, with age, gender, race/ethnicity, income, education, and geographic locations identified as potential predictors for developing obesity and other chronic illnesses (Hales et al., 2016). Global initiatives focused on increasing physical activity (PA) levels and improving nutritional health have been implemented and studied to ascertain the sufficient levels of PA and the essential ingredients of a balanced diet that are recommended for achieving and maintaining a healthy weight as well as improving health outcomes (Livingston, 2018). In spite of public health and health care efforts across several decades that focused on PA and diet, obesity and obesity-related diseases have continued to increase at alarming rates, especially in developed countries such as the United States (Livingston, 2018). The prevalence of obesity among the U.S. adult population increased across all adult age groups in 2018 (CDC, 2019; Livingston, 2018). Meanwhile, informal caregiving duties have continued to increase in recent years. Compounded with numerous other family, work, and community responsibilities, caregivers may be at a higher risk for developing obesity due to exhaustion, limited time for leisure time PA, and a lack of energy for preparing nutritious meals (Warren et al., 2018). Focusing this research project on informal caregiver status, length of time dedicated to caregiving, and obesity status while exploring other risk factors and possible moderators provided meaningful insights into

another area of the population for public health practitioners, policymakers, and health care professionals to target their efforts.

In the following sections of this chapter, I discuss the background rationale for the study, the problem statement, the purpose of the study, the research questions, the theoretical framework, and the nature of the study before providing a comprehensive literature review and concluding with the significance of the study.

Background

Obesity became a phenomenon in the United States beginning as recent as the 1980s and has continually been increasing since that period of time. Even with communication strategies designed to encourage weight loss and healthier eating habits, the increasing obesity trends have continued for decades (Livingston, 2018). Focusing interventions on the individual level have had marginal success because they often fail to account for the unique characteristics, sociodemographics, and cultural/social norms of the individual (Livingston, 2018). Following a review of numerous, evidence-based, high-quality studies representing 11 countries, Dollman (2018) discussed the importance of incorporating a social ecological approach for improving PA levels and for subsequently improving obesity prevalence when conducting future research efforts specifically focused on context; setting; and ensuring interventions are responsive and aligned with each age group, gender, geographic location, and disadvantaged group within each of these demographic categories. Trivedi et al. (2015) also conducted an analysis using secondary data from the National Health and Nutrition Examination Survey (NHANES) and found significantly higher obesity prevalence among all rural

race/ethnic groups compared to their urban counterparts with Black adults experiencing higher obesity prevalence in rural communities when compared to all other race/ethnic groups. This finding indicated the need to focus future research studies on examining social determinants of health that may be risk factors for developing obesity in rural communities with a special focus on the highest risk sectors.

Other researchers have found that gender and environmental disparities exist related to nutrition, PA, and SB. Varì et al. (2016) examined biological and environmental differences between genders that influenced health status, including potential factors that may lead to obesity and other health conditions, and found that a combination of socio-cultural factors, economics, and family role expectations affect dietary habits and PA levels differently between genders and proposed a tailored systems approach that integrates a multidimensional approach for improving gender disparities. Warren et al. (2018) conducted a separate, qualitative study using focus groups to ascertain African American women's perceptions related to factors that influenced sedentary behaviors (SBs) to understand barriers that hindered participation in leisure time PA and determine possible strategies for decreasing SBs with the common thread being that African American women caregivers sought SB activities as a means to compensate for their otherwise stressful and complex lives.

Consistently, studies have indicated that the obesity epidemic is continuing to increase in spite of efforts by many professionals to combat this public health crisis. Examining known risk factors for becoming obese and potential moderators to the obesity phenomenon in the context of informal caregiving has the potential to address the

needs of one important sector of the U.S. population that may be at risk of developing

obesity and obesity-related diseases over their life span.

Problem Statement

Obesity and physical inactivity are closely linked and remain high-priority public

health issues. Obesity and physical inactivity have been identified as two of the leading

risk factors for developing chronic illnesses (Bauer et al., 2014). From 2004 to 2014,

childhood obesity trends remained similar but adult obesity trends increased (Hales et al.,

2017). While minimal changes in the prevalence of obesity were found among children,

youth, and adults when comparing the 2014 NHANES data to the 2016 NHANES data,

the prevalence of obesity remained at nearly 40% among U.S. adults (Hales et al., 2017;

Sarwer & Grilo, 2020). In addition, the adult population segments identified as most at

risk of being overweight or of becoming obese were individuals between the ages of 40

and 59 years old with the prevalence of obesity highest among youth and adults who

identified as non-Hispanic Black and Hispanic when compared to other ethnic groups

(Hales et al., 2017). Finally, according to the CDC (2018a), approximately 60% of adults

in the United States are living with at least one chronic illness, while 40% of adults are

living with multiple chronic illnesses. Consequently, it is estimated that the obesity

epidemic is responsible for approximately $480 billion in direct health care costs and

$1.24 trillion in indirect work-related costs annually in the United States due to illness,

disability, absenteeism, presenteeism, and premature mortality (Ramasamy et al., 2019).

Given the increasing obesity trends, subsequent increases in chronic illnesses

across the life course, and the severe economic impact of obesity-related diseases, PA

levels were recognized as a high-priority public health focus beginning in 2012 (Ding et al., 2016; Kohl et al., 2012; Reis et al., 2016; Sallis et al., 2016). Even though most countries have national PA policies, the continued increase in obesity rates globally indicates a need to further examine factors, such as sociodemographic characteristics (i.e., age, gender, income, education, and employment status), insufficient PA levels, SBs, caloric intake, and geographic location, that continue to contribute to the rising obesity trends nationally and internationally (Organisation for Economic Co-operation and Development [OECD], 2019).

Compounding the obesity epidemic and diminishing PA levels are the increasing number of spouse and adult children, informal caregivers of persons who are younger, who are living longer, and who require multiple and higher intensity levels of care for numerous health conditions compared to prior decades. Wolff et al. (2018) found that individuals receiving informal care were younger, were better educated, and were racially diverse, while those providing primary care needs were more likely to be adult children who provided an average of 30 hours per week of unpaid care giving services for older family members in addition to other family caregiver and work responsibilities. Adult children caregivers provided more intense and complicated care services for their older family members and reported higher levels of mental distress and challenging caregiver difficulties at each survey point over a 16-year period (Wolff et al., 2018). Flinn (2018) found similar characteristics among informal caregivers, noting that a diverse group of millennials comprise approximately 25% of the nearly 40 million informal family caregivers in the United States annually. In a separate study, Whitley and Fuller-

Thomson (2017) found that grandfathers who were the primary caregivers for their grandchildren were in poorer health compared to younger male caregivers and that while single fathers were in better health than grandfather caregivers, their health was poorer when compared to the general population. Older, single, male caregivers who were obese, smoked, and did not participate in any level of PA were identified as vulnerable to long-term poor health outcomes and premature mortality (Whitley & Fuller-Thomson, 2017). In a longitudinal study conducted over 23 years, women who provided informal caregiving services for a spouse in their own home were found to have poorer health outcomes, be more financially challenged, be less likely to work outside of the home, and be more likely to report mental distress when compared to noncaregiving women and when compared with women who provided care for a parent in a setting other than the caregiver's home (Caputo et al., 2016). Furthermore, it has been determined that chronic stress that culminates during midlife can lead to poor dietary choices; decreased PA; and changes in metabolic function, increased abdominal fat, increased obesity levels, impaired cognition, and poorer health outcomes later in life (Dye et al., 2017).

Informal caregivers are especially challenged when attempting to be physically active and to eat healthier when living in a rural community due to a lack of access to safe places to engage in PA; limited access to healthy food choices; and a lack of time, interest, and energy to participate in PAs or to cook healthier meals (Petersen et al., 2019; Warren et al., 2018). In urban settings, a lack of policy maker interest and funding allocation has led to continued disadvantages across sectors of urban communities because many neighborhoods are located in food deserts and only have access to safe

places for engaging in PAs and to healthier food choices via public transportation,

resulting in additional barriers for informal caregivers to focus on their personal health

and well-being (OECD, 2019).

Because the relationship between urban/rural status, socioeconomic status, and

health outcomes (specifically obesity) are not fully understood, Cohen et al. (2017) used

national secondary survey data and geospatial mapping to examine factors among older

adult residents that may have contributed to increased obesity trends. The researchers

were simultaneously able to compare the variability across states between rural/urban

status and the contribution to obesity among older adults. Their findings indicated that the

geographic location-obesity association is complex and nonlinear, the most urban and

most rural areas had lower obesity rates, the intermediate urban and rural older residents

experienced the highest levels of obesity, and there was great variability across states,

indicating a need to further assess rural/urban geographic locations and health disparities

(Cohen et al., 2017).

Middle-aged adults have the highest risk of becoming overweight and/or of

developing obesity and associated chronic illnesses (Hales et al., 2020). With the increase

of adult children as primary caregivers of both children and of older family members who

have more intensive medical needs, children and youth at risk of emulating their parents

dietary and PA patterns, and continued rural/urban health disparities existing, it was

imperative to conduct this research study that examined obesity rates among informal

U.S. adult caregivers in order to better understand additional risk factors that may be

contributing to the increasing obesity trends in the United States, especially since half of

the millennial, informal caregivers are African American/Black, Hispanic/Latino, or American/Pacific Islanders (Cohen et al., 2017; Flinn, 2018; OECD, 2019; Wolff et al., 2018).

Purpose of the Study

The aim of this quantitative study was to investigate the impact of informal caregiving on obesity prevalence while examining possible moderators (i.e., general health and where a person resides) as well as other known contributing factors to the obesity epidemic, such as smoking status, age, sex, race-ethnicity, household income, education level, employment status, diabetes status, and PA levels, among U.S. adults (see CDC, 2014; Cohen et al., 2017; Daly et al., 2017; Ding et al., 2016; Dollman, 2018; Meyer et al., 2016; Trivedi et al., 2015). I examined and analyzed secondary quantitative data collected through annual surveys and that were considered representative of the U.S. population for possible associations.

First instituted as an important, public health, cross-sectional survey tool in 1984 to guide health prevention and promotion interventions, influence policy, and better target limited financial resources for improved health across communities, historically the Behavioral Risk Factor Surveillance System (BRFSS) has proven to be an excellent secondary data set for conducting social science research (CDC, 2014). Even though the survey is based on self-reported answers, numerous studies have shown it is the premier secondary data set for capturing population health behaviors and for instituting prevention measures (CDC, 2014). In addition, when rigorous, evidence-based research examining the reliability and validity of the BRFSS survey data has been conducted, the

overarching theme is that the data set has stood up to the tests and has proven to be a good or better secondary data set when compared to any other self-reported survey available (CDC, 2017a). Even though some of the BRFSS individual measurements may not be as reliable and valid as the overall survey, the size of each annual survey conducted, the random sampling techniques used, and the way the data are aggregated provides a robust data set for local, state, and national public health professionals, policymakers, and health care personnel to utilize when examining and instituting research studies and health behavior interventions as well as allocating funding to the highest priority health issues (CDC, 2017a).

Significant to the current research study is the addition of the caregiver module to the BRFSS survey beginning in 2013 after rigorous pilot testing was completed in North Carolina (see CDC, 2020). Recognizing that more family and friends are assuming informal, unpaid, caregiver responsibilities that would otherwise result in the use of existing and already strained community resources and recognizing the additional stress and potential negative health consequences of being a caregiver, the caregiving module has been used to capture caregiving information and potential health outcomes associated with informal caregiving (CDC, 2020). As the caregiving module was optional during the 2018 BRFSS survey cycle, a few states (i.e., Georgia, New Jersey, and Oregon) elected to incorporate this particular module into their ongoing surveys even though informal caregiving has been identified as a significant public health issue (CDC, 2020). For this reason, I examined data from those states mentioned above as part of this study. This project was unique because it sought to explore other possible sources of rural/urban

obesity discrepancies by examining the role of informal caregiving in order to fill a gap in the existing public health research, especially since obesity remains on the rise in the United States, caregiving remains an underrecognized and underresearched phenomenon, and existing evidence suggested health disparities continued to exist based on a number of biological, environmental, and socio-cultural factors (see Flinn, 2018; Horner-Johnson et al., 2015; Varì et al., 2016; Wen et al., 2018).

Research Questions and Hypotheses

RQ1: Is there a statistically significant association between providing regular care for a family member or friend (i.e., yes or no) and being overweight/obese (i.e., yes or no) among adults from Georgia, New Jersey, or Oregon?

$H_0 1$: There is no statistically significant association between providing regular care for a family member or friend (i.e., yes or no) and being overweight/obese (i.e., yes or no) among adults from Georgia, New Jersey, or Oregon.

$H_A 1$: There is a statistically significant association between providing regular care for a family member or friend (i.e., yes or no) and being overweight/obese (i.e., yes or no) among adults from Georgia, New Jersey, or Oregon.

RQ2: Is there a statistically significant association between how long care has been provided by the respondent (i.e., less than 30 days, 1 to 6 months, 6 months to less than 2 years, 2 years to less than 5 years, or more than 5 years) and being

overweight/obese (i.e., yes or no) among adults from Georgia, New Jersey, or Oregon?

$H_0$2: There is no statistically significant association between how long care has been provided by the respondent (i.e., less than 30 days, 1 to 6 months, 6 months to less than 2 years, 2 years to less than 5 years, or more than 5 years) and being overweight/obese (i.e., yes or no) among adults from Georgia, New Jersey, or Oregon.

H_A2: There is a statistically significant association between how long care has been provided by the respondent (i.e., less than 30 days, 1 to 6 months, 6 months to less than 2 years, 2 years to less than 5 years, or more than 5 years) and being overweight/obese (i.e., yes or no) among adults from Georgia, New Jersey, or Oregon.

RQ3: Does general health status (i.e., excellent, very good, good, fair, or poor) moderate the relationship between providing regular care for a family member or friend (i.e., yes or no) and being overweight/obese (i.e., yes or no) among adults from Georgia, New Jersey, or Oregon?

$H_0$3: General health status (i.e., excellent, very good, good, fair, and poor) does not moderate the relationship between providing regular care for a family member or friend (i.e., yes or no) and being overweight/obese (i.e., yes or no) among adults from Georgia, New Jersey, or Oregon.

H_A3: General health status (i.e., excellent, very good, good, fair, and poor) does moderate the relationship between providing regular care for a family

member or friend (i.e., yes or no) and being overweight/obese (i.e., yes or

no) among adults from Georgia, New Jersey, or Oregon.

RQ4: Does county geographic location (i.e., urban or rural) moderate the

relationship between providing regular care for a family member or friend (i.e.,

yes or no) and being overweight/obese (i.e., yes or no) among adults from

Georgia, New Jersey, or Oregon?

$H_0$4: County geographic location (i.e., urban or rural) does not moderate

the relationship between providing regular care for a family member or

friend (i.e., yes or no) and being overweight/obese (i.e., yes or no) among

adults from Georgia, New Jersey, or Oregon.

H_A4: County geographic location (i.e., urban or rural) does moderate the

relationship between providing regular care for a family member or friend

(i.e., yes or no) and being overweight/obese (i.e., yes or no) among adults

from Georgia, New Jersey, or Oregon.

Theoretical Framework

Social cognitive theory (SCT) provided the theoretical foundation for this

research study. SCT, first introduced by Bandura in the 1970s, includes the specific

constructs of self-efficacy, collective efficacy, and reciprocal determinism (Bandura,

1986; Kelder et al., 2015), which were the foundational constructs used to address the

research questions in the current study. SCT is used to examine how individuals are

shaped by their environment (Bandura, 1986). For the purposes of this study, the

intention of using SCT was to better understand the impact of an individual's caregiver

role in either increasing or decreasing their self-care and efficacy behaviors. Seeking to understand the interactions between the environment and the person, especially when an informal caregiver role was present, assisted in informing ways to improve and increase self- and collective community efficacy efforts and will help to provide more opportunities for incorporating self-care strategies and PA opportunities in the home, community, and employment settings to improve obesity-related health outcomes across the nation. In other words, through gaining a better understanding of the individual (i.e., the caregiver), the environments in which they live (i.e., their home and community), and how the two continually impact and shape one another (i.e., reciprocal determinism) in this study, public health officials and community leaders may be able to align with caregiver communities in order to create more effective strategies for tackling the multifaceted and complex issue of obesity by identifying and working to remove any barriers or impediments to improving caregiver self- and collective efficacy efforts.

This particular study was focused on gaining insights into the environment and caregiver relationships. Based on the relationships found between caregiver status, length of time as a caregiver, and obesity rates, future studies and interventions could focus on what factors motivate informal caregivers to adopt and model healthy lifestyle behaviors for their households or what factors might inhibit informal caregivers from striving to improve and maintain healthy lifestyles for themselves and their households. The findings of this study could ultimately lead to obesity prevention strategies that include targeted approaches geared specifically towards the growing number of informal caregivers in the United States.

It was also interesting to further examine the characteristics of informal caregivers against the backdrop of the obesity epidemic. Together, the research questions and the descriptive statistics analysis provided a first step in understanding one more aspect of the obesity issue for practitioners and policymakers to consider.

Nature of the Study

In this study, I used a quantitative approach with a cross-sectional (i.e., observational) design. A cross-sectional study design was appropriate for this study because it was relatively inexpensive to conduct, it allowed for examination of potential relationships between respondents' obesity status and informal caregiver status, respondents' length of time as an informal caregiver, and respondents' general health and geographic location as well as a number of other determinants of health across one sector of the United States at a single point in time (see Aschengrau & Seage, 2014). Simultaneously, the nature of this study allowed for the ability to describe what is currently occurring related to the obesity epidemic among informal caregivers in three different states representing different regions of the United States, which should have allowed for the results to be applicable to the general population (see Aschengrau & Seage, 2014).

Secondary Data Types and Sources of Information

In this research study, I used the BRFSS to conduct the analysis. With over 400,000 telephone health surveys completed annually, using both landlines and cell phones and random sampling methods, the BRFSS collects demographic, health behavior, chronic disease, and preventive health services information from a

representative sample of the U.S. population that can be used at the local, state, and national levels to inform the development of targeted health promotion efforts for improving health outcomes where the greatest disparities exist (CDC, 2014). The 2018 BRFSS survey data were used to address the research questions in this study because this secondary data source included the most recently published and publicly available data and included the secondary data needed for this study analysis. BRFSS 2018 survey data were collected 7 days a week during both evening hours and daytime hours every week from January 1, 2018 through December 31, 2018 (CDC, 2019). Because states could choose to ask questions included in the optional modules and since caregiver questions were not asked in each state, I selected cases based on the availability of this data to address the research questions (see CDC, 2019).

The target population under study included all adult age groups. The predictor variable was the nominal variable of CAREGIV1 (Y/N) to indicate informal caregiver status for RQ1, and the categorical variable of CRGVLNG1 was used to indicate the length of time each respondent had been caregiving for RQ2, while the dependent variable was the nominal variable of overweight/obesity status (i.e., body mass index [BMI] categories recoded) for both RQ1 and RQ2. The moderator variables were the nominal/categorical variables of GENHLTH, to capture the respondents' general health status for RQ3, and URBSTAT, to capture whether the respondent resided in an urban or rural county for RQ4. Finally, the descriptive nominal/categorical variables for the study included the respondent demographic variables for state code, smoking status, age,

gender, race-ethnicity, household income, education level, employment status, PA level, and diabetes status.

Significance

The results of this study provided insights into the health effects of being an informal unpaid caregiver, which is one subset of the population at risk for becoming obese (see Varì et al., 2016; Warren et al., 2018). The results of the study (in conjunction with previous research efforts) can be used to develop obesity-related, chronic illness health promotion and prevention programs in the areas of greatest need locally and across the country while simultaneously being used to inform practice decisions focused on informal caregiver sectors where the greatest disparities continue to exist (see Trivedi et al., 2015). In addition, a community-based participatory research process will begin at the local level to address potential environmental and cultural-based factors that may be contributing to disparities related to general health, geographic location, and obesity trends among U.S. adult informal caregivers (see Wallerstein et al., 2018).

Positive Social Impact

Gaining insights into the role of informal caregiving as a potential contributing factor to obesity has the potential to alter the way public health professionals and policy makers approach the issue of obesity. The findings of this study revealed that an entire sector of the population has been overlooked in previous research studies and obesity prevention programs, which should lead to opportunities to influence public health efforts to alleviate the time and stress associated with caregiving that can negatively affect a person's health with a specific focus on low-income, adult, informal caregivers because

they may lack the ability to hire outside help to assist with caregiver duties (see Flinn, 2018). Potentially freeing up time through publicly funded, respite care programs/services and removing stressors associated with being an informal caregiver has the potential to provide individuals and communities of informal caregivers with the ability to regain a focus on incorporating healthy self-care strategies into their daily schedules (Flinn, 2018; Sung & Etemadifar, 2019; Warren et al., 2018; Wolff et al., 2018). Having more time, less stress, and safe areas to engage in PAs can help to improve efforts to reduce the obesity epidemic in the United States (Flinn, 2018; Warren et al., 2018).

Obviously, the factors analyzed in this research study did not fully explain the reasons why obesity rates continue to increase. More investigations will need to be conducted to gain a better understanding of the ways in which these variables interact, but at the very least, providing caregivers with more support on a number of levels could be the start of decreasing the obesity prevalence among U.S. adults who may also be informal caregivers. Conducting a research study that examined associations between caregiver status, length of time as a caregiver, and obesity status builds on existing research efforts, helps to inform programming and policy decisions based on where needs are greatest, and provides insights into developing a more integrated approach to a "health in all policies" perspective that includes social service organizations, health care professionals, public health practitioners, faith communities, informal caregivers, and community members working collaboratively together to address the unique needs of

informal caregivers regardless of where they live, work, and play (see Polsky et al.,

2015).

Literature Search Strategy

This search for literature to review for this study included relevant, evidence-

based, seminal, and trusted government website information from multiple databases.

The initial keywords searched were *obesity or obese or overweight or BMI*, *BRFSS or*

Behavioral Risk Factor Surveillance System, and *disparities or disparity or inequities or*

inequality, which resulted in 686 nonduplicative results. After applying the limits of

being peer reviewed and the year of publication as 2015 and forward, the resulting search

indicated 160 references. I also added search string words such as *rural or regional or*

remote (20 results), *race or ethnicity or minority or African American or Hispanic*

American or Latino American or Asian American (99 results), *environmental or societal*

or sociodemographic or policy or community (119 results), *caregiving or caregiver or*

family carer or informal caregiver (54 results) to *obesity or obese or overweight or BMI*.

Finally, I searched the phrases *physical activity in urban and rural communities*; *obesity,*

caregiving (carer and other words that indicated caregiving in other countries); and

sedentary behaviors in Google Scholar, SAGE Journals, and the Walden Thoreau

multidatabase search tool.

I chose peer-reviewed articles published after 2015 to review for this study.

Duplicate references were eliminated, and the final literature review comprised only

those articles specific to the inclusion criteria, which was determined to be: (a) relevant to

obesity and obesity-related illnesses, (b) relevant to caregiving, (c) relevant to public

health and health care, and (d) English language articles. Seminal works from as early as the 1970s related to Bandura's SCT were also included. The final literature review was comprised of 111 articles and reliable government resources.

<div align="center">**Literature Review**</div>

Preventable obesity and obesity-related diseases contribute to poor health outcomes; increased annual health care expenses; and increased costs to society, the community, families, and individuals due to unanticipated illnesses and diseases, missed work or presenteeism, disability, and premature death (Alston et al., 2016; Cooper & Lu, 2016; Svärd, 2019). While obesity remains a complex public health concern, it is imperative that research efforts continue to focus on the multifaceted dimensions contributing to the growing numbers of individuals becoming obese.

Obesity Epidemic

Obesity remains one of the leading causes of preventable death. With over 300,000 preventable deaths annually attributed to the combination of being overweight or obese, the fact that obesity is linked to many chronic illnesses from cancer to diabetes to heart disease, and the fact that previous research has indicated obesity rates vary significantly based on a number of variables, obesity has become one of the most important, global, public health issues (Sarwer & Grilo, 2020; Sung & Etemadifar, 2019). According to the BRFSS 2018 survey data, approximately 65.8% of all respondents in the United States reported being overweight or obese (CDC, 2017b). In comparison, the percent of Georgia respondents identifying as overweight or obese was 67.3%, while New Jersey reported 62.4% and Oregon 64.1%. Throughout the United States, including

the three states mentioned above, respondents were more often overweight than obese

(CDC, 2017b).

Informal Caregivers

Limited research has focused on the impact that informal caregiving roles may

have on health outcomes even though the majority of informal caregivers are family

members who are employed outside of the home; have lower income ranges; are a more

ethnically diverse group; and in many cases, mirror the highest risk groups found to be

overweight or obese in the United States (Flinn, 2018; Sung & Etemadifar, 2019). Family

caregivers provide a substantial amount of unpaid but significant and intense medical

care for loved ones and friends in addition to running errands and taking care of chores,

cooking, medication management, and doctor appointment coordination (Flinn, 2018). In

a study using the 2012 Oregon BRFSS module caregiving survey data, no significant

differences were found in obesity rates when comparing informal caregivers to

noncaregivers; however, caregivers had significantly greater odds of experiencing food

insecurity in their households and personal hunger even after controlling for other food

insecurity risk factors (Horner-Johnson et al., 2015). Other studies that were more than 5

years old contradicted the findings concerning caregiver health, indicating a discrepancy

in the literature regarding caregiver health outcomes (Fineberg, 2008). In addition, a

systematic review of the literature by Chiao et al., (2015) found that significant caregiver

burdens with poor health outcomes ensued based on the specific duties and emotional

stressors that caregivers of family members with dementia assumed, resulting in a call to

action for improved policies to support the health and well-being of both the caregivers and the care recipients.

Sociodemographic Risk Factors

While previous research efforts have focused on PA, nutrition, and educational campaigns for weight reduction, numerous studies found that disparities existed based on several demographic risk factors, such as age; gender; race-ethnicity; income; educational attainment; and where a person lived, worked, and played (Livingston, 2018). Using secondary data from both the BRFSS and the NHANES from over a 16-year period and after correcting for potential reporting bias, Ward et al. (2019) used multinomial regression analysis by state and by specific subgroups to predict that almost 1 out of every 2 adults will become obese by the year 2030 and that the obese BMI category will be the most prevalent among women, low income individuals, and Hispanic/Black adults over the next decade.

Building on the previously discussed studies, I found a gap in the literature related to conducting a study that examined informal caregiving in more than one state, obesity status, respondents' general health and geographic location, and other known risk factors for becoming obese within the same study using only BRFSS 2018 data, which was filled by carrying out the current study.

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Definitions

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CAREGIV1: The BRFSS 2018 designation of providing care for a family member or friend (CDC, 2018b).

CRGVLNG1: The BRFSS 2018 question regarding how long respondent has provided care or assistance to a family member or loved one (CDC, 2018b).

Obesity status: The BMI categories of underweight, normal, overweight, and obese as defined in the BRFSS 2018 data set (CDC, 2018b).

Predictor variable: The BRFSS survey period for January 1–December 31, 2018, which includes all records during this time from cases with complete data on informal caregiver status and length of time respondent has provided informal caregiving duties (CDC, 2018b).

Dependent variable: BMI categories as designated in the 2018 version of the BRFSS (CDC, 2018b).

Moderator/demographic variables: State code (i.e., Georgia, New Jersey, or Oregon), smoking status (i.e., four categories from current smoker to never smoker), age (i.e., 5-year increments from age 18 to 80 and over), gender (i.e., female or male), race/ethnicity (i.e., computed race-ethnicity grouping categories), income (i.e., income categories from less than $15,000 to greater than $75,000), education level (i.e., categories representing highest level of school completed), employment status (i.e., categories ranging from employed to not employed), PA level (i.e., yes or no to question regarding PA outside of regular job), general health (i.e., categories ranging from excellent to poor for describing self-reported caregiver health), diabetes status (i.e., yes or no), and geographic location (i.e., urban or rural) as designated in the 2018 version of the BRFSS (CDC, 2018b).

Assumptions

I assumed that the collection of the BRFSS survey data by each state and territory across the United States used rigorous, random sampling techniques based on a review of the BRFSS overview materials (see CDC, 2019). Even though the answers were self-reported, another assumption was that the respondents provided accurate information to the best of their knowledge (see CDC, 2019). I further assumed that the information was coded correctly at the state level and interpreted, coded, entered, analyzed, and weighted correctly at the national level by the CDC staff. Finally, based on a review of the BRFSS codebook and the 2018 BRFSS data set, I assumed that there would be enough cases to analyze to determine if associations existed between informal caregiver status, length of time as a caregiver, and obesity status to be able to generalize the findings across the U.S. adult caregiver population.

Scope and Limitations

The data set for the analysis was restricted to the 2018 BRFSS data set because this was the most current data set publicly available. This could be a limitation because the data set only contained a single year of survey data for analysis; therefore, conclusions must be interpreted cautiously to avoid over- or underestimating associations based on a single point in time.

Another limitation may be related to how many states actually asked the caregiving questions in the optional module, which may have limited the ability of the study findings to generalize to all states and territories across the United States.

Finally, even though the BRFSS guidelines now require both cell phone and landline random sampling techniques, those individuals who refused to participate in the survey or who did not answer their phones after multiple attempts may represent different sectors of the population than the ones who did participate in the BRFSS 2018 survey.

Being cognizant of the potential limitations and scope of the research project throughout the planning phase helped to ensure that bias was minimized and that the results could be beneficial to public health professionals focused on decreasing obesity and obesity-related diseases within their respective communities.

Summary

Obesity remains a significant public health issue and remains costly on a number of levels. Building on previous research efforts that have identified numerous potential risk factors for developing obesity across the adult life span while examining the role of informal caregiving on the increasing rates of obesity has the potential to increase awareness of the special stressors associated with unpaid, family caregiving responsibilities. The increasing trends of family caregiving, especially among millennials who primarily represent racial/ethnic groups already at risk for becoming obese over the course of their lifetimes, offers the potential to proactively focus on prevention efforts, policy changes, and health care services that optimize the health of care recipients as well as family caregivers.

Section 2: Research Design and Data Collection

As discussed in Section 1, the aim of this quantitative study was to investigate the impact of informal caregiving on obesity prevalence while also examining other important moderators and known contributing factors to the obesity epidemic as well as analyzing demographic and additional health characteristics of the U.S. population under study (see CDC, 2014; Cohen et al., 2017; Daly et al., 2017; Ding et al., 2016; Dollman, 2018; Meyer et al., 2016; Trivedi et al., 2015). In the following sections, I present the research design and rationale for the study; the methodology; and the threats to validity, including a discussion of research ethics.

Research Design and Rationale

The BRFSS 2018 survey data were collected from January 1, 2018 through December 31, 2018 through a random sampling process that involved collecting data 7 days a week (CDC, 2019). Trained surveyors from each state collected data for all core sections and for the prior selected modules by each state that would prove meaningful for their local and state planning purposes. Surveys were conducted every day of the year during both evening and daytime hours in an effort to capture representative data from respondents. The BRFSS 2018 secondary data set included the predictor variables for care giving that were used to address each research question. The data set also included the dependent variable of BMI categories that were used to determine obesity rates. Finally, the moderator variables of general health and geographic location along with the descriptive variables that encompassed multiple demographic factors and other health factors were also available in this data set. The rationale for using the BRFSS 2018 data

set was that it provided the most current publicly available data, was able to provide an

adequate sample that was representative of the population from which it was drawn, and

was inclusive of the necessary data required for addressing each research question.

Population

The target population for the study included all respondents who participated in

the 2018 BRFSS survey in the three states (i.e., Georgia, New Jersey, and Oregon) where

caregiver questions were asked ($N = 18,341$).

Sample Size Determination

While BRFSS surveys were completed across the United States during 2018,

Georgia, Oregon, and New Jersey chose to include the optional caregiver questions

during their data collection phone conversations. Therefore, the final available data set

for analysis included responses from those three states ($N = 18,341$). I performed a power

analysis using G-Power software (see Faul et al., 2009), assuming a two-tail test, an odds

ratio of 1.49, an alpha of 0.05, and a minimum statistical power of 0.80. A null

hypothesis probability of the dependent variable being equal to 1 if the independent

variable was equal to 1 of 0.45 produced a minimum sample size of 786. I assumed an

effect size of 55% because the effect of being overweight/obese upon being a caregiver is

unknown. The large size of the BRFSS 2018 data set for the three states chosen for

analysis helped to minimize any bias due to missing data, increased the ability to observe

significant relationships if any existed, and allowed for assessing the strength any

relationships between variables (see Creswell & Creswell, 2018).

Method of Data Collection

The BRFSS survey data process is coordinated by the CDC and is collected daily

across the United States by each state and territory. State health departments, in

partnership with call centers and universities, are responsible for administering the

surveys with technical and other assistance from the CDC as needed. Results are reported

to the CDC at a national level, where trained personnel aggregate the data for use at the

local, state, and national levels to address pressing health issues (CDC, 2019). After the

2011 cycle, the survey procedures fully incorporated the use of both land line and cellular

phones for collecting survey data in an attempt to strengthen the ability of the data to be

representative of the population (CDC, 2019).

For this study, I downloaded the 2018 BRFSS data from the CDC website in a

Microsoft Excel format and then transferred them into IBM Statistical Package for Social

Sciences (SPSS) Version 27 for review and final analysis. Only publicly available data

were used to address the research questions with confidentiality and anonymity measures

already accounted for at the state and national levels (see CDC, 2019).

One internal validity consideration was potentially the size, characteristics, and

recall bias of the subject population. This internal validity aspect could interfere with the

trustworthiness of the findings and could lead to conclusions that are misleading as other

factors may have contributed to any associations that were found to exist (see Azofeifa et

al., 2018). Another internal validity concern was related to the differences in random

sampling methods used by each individual state and territory, which might have excluded

some important segments of the population from the surveys (see CDC, 2019; Creswell & Creswell, 2018).

One external validity concern was that only three states incorporated the optional caregiver module questions in their BRFSS 2018 surveys, which could have posed an issue to the ability to generalize the outcomes to different locations (see CDC, 2019).

Variables

The main variables used in the analysis were caregiver variables; overweight/obese variables as categorized by BRFSS 2018 BMI categories; moderator variables to represent general health and geographic location; and important sociodemographic variables, including other health-related variables of each survey respondent. The variables were introduced into the data analysis model as a predictor, dependent, moderator, or demographic variable.

Predictor Variable

The predictor variable for RQ1 was the nominal variable for providing care for a family member or friend. The predictor variable for RQ2 was the length of time care was provided by an informal caregiver. The predictor variable descriptions and coding are listed in Table 1.

Dependent Variable

The dependent variable of obesity was determined using the nominal variable of BMI categories from the BRFSS variable, BMI5CAT. The variable was recoded to a dummy variable (i.e., recode_BMI5CAT) indicating overweight/obese (i.e., yes or no). The dependent variable definition and coding is listed in Table 1.

Moderator

The moderator variables included general health and the urban or rural status of

the county of the respondent's home. The moderator variable definitions and coding are

listed in Table 1.

Table 1

Predictor, Moderator, and Dependent Variable Definitions and Coding

Variable name	Type of measure	Definition	Use	Variable codes
CAREGIV1	Nominal	Provided regular care for family member or friend	Predictor	Yes = 1; No = 2
CRGVLNG1	Ordinal	How long have you provided care	Predictor	Less than 30 days = 1; 1– 6 months = 2; 6 months to < 2 years = 3; 2 years to < 5 years = 4; > 5 years = 5
Recode_BMI5 CAT	Nominal	Overweight/obese	Dependent	Yes = 1; No = 2
GENHLTH	Ordinal	General health	Moderator	Excellent = 1; Very Good = 2; Good = 3; Fair = 4; Poor = 5
URBSTAT	Nominal	Urban or rural county	Moderator	Urban = 1; Rural = 2

Demographic Variables

Sociodemographic data included the BRFSS 2018 nominal variables of state, age,

gender, race-ethnicity, household income, education level, employment status, exercise of

any kind outside of normal work within the last 30 days, subject ever being told they

have diabetes, and frequency of smoking at the time of the survey. The variables were

included to further define the population. Table 2 includes all demographic variables and

coding.

Table 2

Demographic Variable Definitions and Coding

Variable name	Type of measure	Definition	Use	Variable codes
STATE	Nominal	State	Demographic	Georgia = 13; New Jersey = 34; Oregon = 41
SEX1	Nominal	Respondent's sex	Demographic	Male = 1; Female = 2
AGEG5YR	Nominal	Reported age in 5-year age categories	Demographic	Age 18 to 24 = 1; Age 25 to 29 = 2; Age 30 to 34 = 3; Age 35 to 39 = 4; Age 40 to 44 = 5; Age 45 to 49 = 6; Age 50 to 54 = 7; Age 55 to 59 = 8; Age 60 to 64 = 9; Age 65 to 69 = 10; Age 70 to 74 = 11; Age 75 to 79 = 12; Age 80 or older = 13
EDUCA	Nominal	Education level	Demographic	Never attended school or only kindergarten = 1; Grades 1 through 8 = 2; Grades 9 through 11 = 3; Grade 12 or GED = 4; College 1 to 3 years = 5; College 4 years or more = 6
EMPLOY1	Nominal	Employment status	Demographic	Employed for wages = 1; Self-employed = 2; Out of work for ≥ 1 year = 3; Out of work for < 1 year = 4; A homemaker = 5; A student = 6; Retired = 7; Unable to work = 8
INCOME2	Nominal	Income level	Demographic	Less than \$10,000 = 1; \$10,000 to < \$15,000 = 2; \$15,000 to < \$20,000 = 3; \$20,000 to < \$25,000 = 4; \$25,000 to < \$35,000 = 5; \$35,000 to < \$50,000 = 6; \$50,000 to < \$75,000 = 7; \$75,000 or more = 8
RACE	Nominal	Computed race-ethnicity grouping	Demographic	White only, non-Hispanic = 1; Black only, non-Hispanic = 2; American Indian or Alaskan Native only, Non-Hispanic = 3; Asian only, non-Hispanic = 4; Native Hawaiian or other Pacific Islander only, Non-Hispanic = 5; Other race only, non-Hispanic = 6; Multiracial, non-Hispanic = 7; Hispanic = 8
EXERANY2	Nominal	Exercise in the past 30 days	Demographic	Yes = 1; No = 2
DIABETE3	Nominal	Ever been told you have diabetes	Demographic	Yes = 1; No = 2
SMOKDAY2	Nominal	Frequency of days now smoking	Demographic	Every day = 1; Some days = 2; Not at all = 3

Statistical Design

I used SPSS, Version 27 for the data analysis in this study. The BRFSS data set was downloaded in Microsoft Excel and was cleaned in SPSS. The original file contained 437,436 records, with the states of Georgia, New Jersey, and Oregon representing a total of 18,341 records. The final sample size for analysis needed to be a minimum of 786 cases based on the power analysis previously discussed in the Sample Size Determination subsection. I thoroughly reviewed each record for missing data or inconsistencies. Data records with missing information were excluded. Variables not needed in the analysis were excluded from the data set as well. Chi-square test of association and logistic regression were chosen as the statistical analysis strategy to address the research questions. I assessed corresponding assumptions to ensure that appropriate analytical tests were used for the analysis of each research question. As a result, RQ1 and RQ2 were addressed using the two-by-two Chi-square test of association while RQ3 and RQ4 were addressed using logistic regression after a moderator variable for health status (RQ3) and geographic location (RQ4) were created. Frequency tables were included for descriptive analysis of additional variables. Finally, I conducted additional tests to determine the strength and effect size of any associations, if any existed.

Research Questions and Hypotheses

RQ1: Is there a statistically significant association between providing regular care for a family member or friend (i.e., yes or no) and being overweight/obese (i.e., yes or no) among adults from Georgia, New Jersey, or Oregon?

$H_0 1$: There is no statistically significant association between providing

regular care for a family member or friend (i.e., yes or no) and being

overweight/obese (i.e., yes or no) among adults from Georgia, New

Jersey, or Oregon.

$H_A 1$: There is a statistically significant association between providing

regular care for a family member or friend (i.e., yes or no) and being

overweight/obese (i.e., yes or no) among adults from Georgia, New

Jersey, or Oregon.

RQ2: Is there a statistically significant association between how long care has

been provided by the respondent (i.e., less than 30 days, 1 to 6 months, 6 months

to less than 2 years, 2 years to less than 5 years, or more than 5 years) and being

overweight/obese (i.e., yes or no) among adults from Georgia, New Jersey, or

Oregon?

$H_0 2$: There is no statistically significant association between how long

care has been provided by the respondent (i.e., less than 30 days, 1 to 6

months, 6 months to less than 2 years, 2 years to less than 5 years, or more

than 5 years) and being overweight/obese (i.e., yes or no) among adults

from Georgia, New Jersey, or Oregon.

$H_A 2$: There is a statistically significant association between how long care

has been provided by the respondent (i.e., less than 30 days, 1 to 6 months,

6 months to less than 2 years, 2 years to less than 5 years, and more than 5

years) and being overweight/obese (i.e., yes or no) among adults from

Georgia, New Jersey, or Oregon.

RQ3: Does general health status (i.e., excellent, very good, good, fair, or poor)

moderate the relationship between providing regular care for a family member or

friend (i.e., yes or no) and being overweight/obese (i.e., yes or no) among adults

from Georgia, New Jersey, or Oregon?

> $H_0$3: General health status (i.e., excellent, very good, good, fair, or poor)
>
> does not moderate the relationship between providing regular care for a
>
> family member or friend (i.e., yes or no) and being overweight/obese (i.e.,
>
> yes or no) among adults from Georgia, New Jersey, or Oregon.
>
> H_A3: General health status (i.e., excellent, very good, good, fair, or poor)
>
> does moderate the relationship between providing regular care for a family
>
> member or friend (i.e., yes or no) and being overweight/obese (i.e., yes or
>
> no) among adults from Georgia, New Jersey, or Oregon.

RQ4: Does county geographic location (i.e., urban or rural) moderate the

relationship between providing regular care for a family member or friend (i.e.,

yes or no) and being overweight/obese (i.e., yes or no) among adults from

Georgia, New Jersey, or Oregon?

> $H_0$4: County geographic location (i.e., urban or rural) does not moderate
>
> the relationship between providing regular care for a family member or
>
> friend (i.e., yes or no) and being overweight/obese (i.e., yes or no) among
>
> adults from Georgia, New Jersey, or Oregon.

H_A4: County geographic location (i.e., urban or rural) does moderate the relationship between providing regular care for a family member or friend (i.e., yes or no) and being overweight/obese (i.e., yes or no) among adults from Georgia, New Jersey, or Oregon.

Threats to Validity

To ensure internal and external validity concerns were addressed, I employed a number of strategies including the use of an adequate sample size based on the reliable G*Power software program power analysis (Creswell & Creswell, 2018). Also, I reviewed the data set for any inconsistencies that might have existed and to ensure that the inconsistencies could be explained or handled properly either prior to the analysis, during the analysis, or after the analysis was conducted (Creswell & Creswell, 2018). Finally, because the three states who chose to incorporate the optional caregiving module questions into their 2018 surveys represented three distinct regions of the United States (south, northeast, and northwest), I determined that the findings should be generalizable to a variety of settings and locations as long as there was an adequate representation of respondents from each state in the aggregated 2018 BRFSS data set.

Ethical Considerations

Ethical considerations were carefully considered even though the BRFSS 2018 data were cleaned and organized for analysis to ensure no researcher bias existed and to protect the integrity of the original aggregated data. A Walden Institutional Review Board (IRB) application was submitted and this study was approved (IRB approval

number 02-05-21-0674745) prior to data collection, data analysis, and subsequent reporting of the data results.

Summary

The study details regarding the research methodology were highlighted in Section 2. A brief overview of the BRFSS history and of the 2018 secondary data set was included. In addition, I discussed the study population, an explanation for determining an adequate sample size for analysis, the data collection methods, the statistical design considerations, the threats to validity, and the ethical considerations while the predictor variables, the dependent variable, the moderator variables, and the demographic descriptive variables to be used in the study were highlighted. I will present the study results in Section 3.

Section 3: Results and Findings

In this study, I sought to examine the relationships between caregiving, the length of time as a caregiver, and obesity prevalence among U.S. adults. Georgia, New Jersey, and Oregon were included in the analysis because they were the three states to include optional caregiving questions during the BRFSS 2018 survey cycle. To provide more depth to the analysis, I also included the general health of the caregiver and the geographic location where the caregiver resided as moderators during the analysis phase. Obesity status, using recoded BRFSS 2018 BMI survey responses, was the dependent/outcome variable. In this section, I discuss the quantitative analysis process, the results, and my interpretation of the results.

Data Collection of Secondary Data Set

I chose the 2018 BRFSS survey as the secondary data set for this analysis because it was the most current publicly available data set and it included sufficient variables and responses to produce a robust analysis of the study topic. The single data set was downloaded from the CDC website and then organized, cleaned, and prepared for analysis using the SPSS, Version 27 software. Potential concerns with using this secondary data set to ensure results were representative of the population from which they were drawn included the use of participant self-reporting when the data were gathered, the discrepancies in reporting from the state level to the national level, the use of three states as representative of the country, and the missing data values. However, the large sample size, the similarity of each of the three states to their regional counterparts when comparing national obesity rates, and the rigorous protocols used when

administering the BRFSS at the state level and when compiling and transferring the data

to the CDC, and when aggregating the data at the national level for analysis provided

adequate safeguards for minimizing bias. Finally, I thoroughly reviewed each record for

missing data or inconsistencies, and data records with missing information were

excluded. After a final review of the data set prior to conducting the analysis, I

determined that the results of the analysis would produce valid, reliable, and

generalizable information that would be useful to local public health and health care

professionals seeking to understand and improve obesity outcomes across the nation.

Descriptive Statistics

The final available data set for analysis included responses from Georgia, New

Jersey, and Oregon. The demographic population included a total sample size of 13,907

records. The G*Power analysis resulted in a minimum sample size of 786 with odds ratio

= 1.49, alpha = 0.05, power = 0.80, and an a priori implementation. Tables 3, 4, and 5

include the results of the analysis for frequency and test for proportions for the predictor,

moderator, dependent, health, and demographic variables because the variables were

categorical and discrete in nature. I excluded data values from the primary data set if the

predictor, moderator, or dependent values were missing.

Table 3

Descriptive Analysis for Predictor, Moderator, and Dependent Variables

Variable name	Category	Frequency	Percentage
CAREGIV1	Yes	2,896	20.8
	No	11,011	79.2
CRGVLNG1	Less than 30 days = 1	525	3.8
	1 - 6 months = 2	333	2.4
	6 months to < 2 years = 3	527	3.8
	2 years to < 5 years = 4	567	4.1
	> 5 years = 5	891	6.4
	Don't know/not sure/refused	49	0.4
	Not answered	11,015	79.2
Recode_BMI5CAT	Yes	9,411	67.7
	No	4,496	32.3
GENHLTH	Excellent = 1	2,263	16.3
	Very good = 2	4,502	32.4
	Good = 3	4,407	31.7
	Fair = 4	2,000	14.4
	Poor = 5	735	5.3
URBSTAT	Urban	12,926	92.9
	Rural	981	7.1

Table 4

Descriptive Analysis for Health Variables

Variable name	Category	Frequency	Percentage
EXERANY2	Yes	10,572	76.0
	No	3,307	23.8
	Don't know/not sure/refused	28	0.3
DIABETE3	Yes	2,187	15.8
	No	11,683	84.0
	Don't know/not sure/refused	37	0.3
SMOKDAY2	Every day = 1	1,427	10.3
	Some days = 2	594	4.3
	Not at all = 3	3,723	26.8
	Don't know/not sure/refused/missing	8,163	58.7

Table 5

Descriptive Analysis for Demographic Variables

Variable name	Category	Frequency	Percentage
STATE	Georgia = 13	7,049	50.7
	New Jersey = 34	2,244	16.1
	Oregon = 41	4,614	33.2
SEX1	Male	6,437	46.3
	Female	7,458	53.6
	Don't know/not sure/refused	12	0.1
AGEG5YR	Age 18 to 24 = 1	924	6.6
	Age 25 to 29 = 2	683	4.9
	Age 30 to 34 = 3	769	5.5
	Age 35 to 39 = 4	890	6.4
	Age 40 to 44 = 5	898	6.5
	Age 45 to 49 = 6	1,014	7.3
	Age 50 to 54 = 7	1,222	8.8
	Age 55 to 59 = 8	1,329	9.6
	Age 60 to 64 = 9	1,472	10.6
	Age 65 to 69 = 10	1,501	10.8
	Age 70 to 74 = 11	1,314	9.4
	Age 75 to 79 = 12	841	6.0
	Age 80 or older = 13	885	6.4
	Don't know/refused	165	1.2
EDUCA	Never attended school or only kindergarten = 1	20	0.1
	Grades 1 through 8 = 2	261	1.9
	Grades 9 through 11 = 3	752	5.4
	Grade 12 or GED = 4	3,487	25.0
	College 1 to 3 years = 5	3,892	28.0
	College 4 years or more = 6	5,459	39.3
	Refused	36	0.3
EMPLOY1	Employed for wages = 1	5,794	41.7
	Self-employed = 2	1,251	9.0
	Out of work for ≥ 1 year = 3	306	2.2
	Out of work for < 1 year = 4	297	2.1
	A homemaker = 5	561	4.0
	A student = 6	434	3.1
	Retired = 7	4,021	28.9
	Unable to work = 8	1,118	8.0
	Refused	125	0.9
INCOME2	Less than $10,000 = 1	526	3.8
	$10,000 to < $15,000 = 2	533	3.8
	$15,000 to < $20,000 = 3	858	6.2
	$20,000 to < $25,000 = 4	1,081	7.8
	$25,000 to < $35,000 = 5	1,195	8.6
	$35,000 to < $50,000 = 6	1,576	11.3
	$50,000 to < $75,000 = 7	1,810	13.0
	$75,000 or more = 8	4,305	31.0
	Don't know/not sure/refused	2,023	14.5
RACE	White only, non-Hispanic = 1	9,725	69.9
	Black only, non-Hispanic = 2	2,006	14.4
	American Indian or Alaskan Native only, Non-Hispanic = 3	124	0.9
	Asian only, non-Hispanic = 4	277	2.0
	Native Hawaiian or other Pacific Islander only, Non-Hispanic = 5	32	0.2
	Other race only, non-Hispanic = 6	78	0.6
	Multiracial, non-Hispanic = 7	310	2.2
	Hispanic = 8	1,071	7.7
	Don't know/not sure/refused	284	2.0

Analysis of Hypotheses

Research Question 1

RQ1: Is there a statistically significant association between providing regular care
for a family member or friend (i.e., yes or no) and being overweight/obese (i.e.,
yes or no) among adults from Georgia, New Jersey, or Oregon?

$H_0$1: There is no statistically significant association between providing
regular care for a family member or friend (i.e., yes or no) and being
overweight/obese (i.e., yes or no) among adults from Georgia, New
Jersey, or Oregon.

H_A1: There is a statistically significant association between providing
regular care for a family member or friend (i.e., yes or no) and being
overweight/obese (i.e., yes or no) among adults from Georgia, New
Jersey, or Oregon.

I performed a chi-square test of independence to examine the association between
providing regular care for a family member or friend and being overweight or obese. The
association between these variables was statistically significant, X^2 (1, N = 13,907) =
11.288, p = .001, V = .028. The strength of the association was examined using Cramer's
V test, and there was a weak association.

Research Question 2

RQ2: Is there a statistically significant association between how long care has
been provided by the respondent (i.e., less than 30 days, 1 to 6 months, 6 months
to less than 2 years, 2 years to less than 5 years, or more than 5 years) and being

overweight/obese (i.e., yes or No) among adults from Georgia, New Jersey, or Oregon?

> $H_0$2: There is no statistically significant association between how long care has been provided by the respondent (i.e., less than 30 days, 1 to 6 months, 6 months to less than 2 years, 2 years to less than 5 years, or more than 5 years) and being overweight/obese (i.e., yes or no) among adults from Georgia, New Jersey, or Oregon.

> H_A2: There is a statistically significant association between how long care has been provided by the respondent (i.e., less than 30 days, 1 to 6 months, 6 months to less than 2 years, 2 years to less than 5 years, or more than 5 years) and being overweight/obese (i.e., yes or no) among adults from Georgia, New Jersey, or Oregon.

I performed a chi-square test of independence to examine the association between the length of time care was provided for a friend or family member and being overweight or obese. The association between these variables was not statistically significant, X^2 (4, $N = 2843$) = 7.438, $p = .114$, $V = .051$. The strength of the association was examined using Cramer's V test, and there was a strong association.

Research Question 3

> RQ3: Does general health status (i.e., excellent, very good, good, fair, or poor) moderate the relationship between providing regular care for a family member or friend (i.e., yes or no) and being overweight/obese (i.e., yes or no) among adults from Georgia, New Jersey, or Oregon?

$H_0$3: General health status (i.e., excellent, very good, good, fair, or poor)

does not moderate the relationship between providing regular care for a

family member or friend (i.e., yes or no) and being overweight/obese (i.e.,

yes or no) among adults from Georgia, New Jersey, or Oregon.

H_A3: General health status (i.e., excellent, very good, good, fair, or poor)

does moderate the relationship between providing regular care for a family

member or friend (i.e., yes or no) and being overweight/obese (i.e., yes or

no) among adults from Georgia, New Jersey, or Oregon.

I performed binomial logistic regression to determine whether general health

status moderated the relationship between being overweight or obese and providing

regular care for a family member or friend. The logistic regression model was statistically

significant, $X^2(1) = 179.622$, $p < .05$. The model explained 1.8% (Nagelkerke R2) of the

variance and correctly classified 67.7% of cases. The moderator variable (i.e., general

health status) with predictor variable (i.e., overweight or obese) was statistically

significant and was shown to contribute to the model. The odds ratio increased by 12%

for the relationship between general health status and providing care for a family member

or friend based on being overweight or obese. The unstandardized Beta weight for the

moderator variable was: B = [0.112], Wald = [173.817], $p = .000$. The odds ratio

increased by 12% [Exp (B) = 1.118, 95% CI (1.100, 1.137)] for general health.

Research Question 4

RQ4: Does county geographic location (i.e., urban or rural) moderate the

relationship between providing regular care for a family member or friend (i.e.,

yes or no) and being overweight/obese (i.e., yes or no) among adults from
Georgia, New Jersey, or Oregon?

$H_0$4: County geographic location (i.e., urban or rural) does not moderate
the relationship between providing regular care for a family member or
friend (i.e., yes or no) and being overweight/obese (i.e., yes or no) among
adults from Georgia, New Jersey, or Oregon.

H_A4: County geographic location (i.e., urban or rural) does moderate the
relationship between providing regular care for a family member or friend
(i.e., yes or no) and being overweight/obese (i.e., yes or no) among adults
from Georgia, New Jersey, or Oregon.

I performed binomial logistic regression to determine whether geographic
location moderated the relationship between being overweight or obese and providing
regular care for a family member or friend. The logistic regression model was not
statistically significant, $X^2(1) = .146$, $p = .702$. The model explained 0% (Nagelkerke R2)
of the variance and correctly classified 67.7% of cases. The moderator variable (i.e.,
urban or rural) with predictor variable (i.e., overweight or obese) was not statistically
significant and did not contribute to the model. The odds ratio increased by 1.1% for the
relationship between urban or rural status and providing care for a family member or
friend based on being overweight or obese. The unstandardized Beta weight for the
moderator variable was: B = [0.011], Wald = [.147], $p = .702$. The odds ratio increased
by 1.1% [Exp (B) = .989, 95% CI (936, 1.046)] for urban or rural status.

Summary

Before statistical analysis, all variables were validated and recoded and

moderators were computed. I completed descriptive summaries with frequencies and

percentages for all categorical variables. Two-by-two chi-square tests of association were

conducted for RQ1 and RQ2, while binary logistic regression was conducted for RQ3 and

RQ4 after a moderator variable for health status (RQ3) and for geographic location

(RQ4) were created. The alternative hypothesis was accepted with statistical significance

for the caregiver status and obesity association for RQ1, although there appeared to be a

weak association present. However, for RQ2, the null hypothesis was accepted because

no statistically significant association between the length of time as a caregiver and

obesity was found to exist. Related to RQ3 and RQ4, general health of the caregiver was

found to moderate the relationship between caregiver status and obesity, while

geographic location did not moderate the relationship between caregiver status and

obesity. Therefore, the alternative hypothesis was accepted for RQ3, while the null

hypothesis was accepted for RQ4. The key findings, social change implications,

theoretical framework alignment, study limitations, and application to professional

practice are presented in Section 4.

Section 4: Application to Professional Practice and Implications for Social Change

The aim of this study was to determine whether an association exists between being a caregiver for a family member or friend, length of time as a caregiver, and obesity status as well as if caregiver general health and the geographic location moderated the relationships. Approximately 45 to 60 million individuals provide informal caregiving duties for loved ones and friends across the United States annually (Berry et al., 2020; Cook & Cohen, 2018). Females, married caregivers, and those individuals who provide intense physical care for others are at the highest risk of experiencing negative health consequences, including a potential increased risk for becoming overweight or obese, as a result of informal caregiving responsibilities (Bom et al., 2019; Plichta, 2018). The study findings indicated that being a caregiver and the caregiver's general health status were associated with obesity prevalence, while length of time as a caregiver and geographic location were not associated with obesity prevalence.

Key Findings

Providing Care and Being Overweight or Obese

Approximately 20% of the 13,907 respondents replied "yes" to being a caregiver, with 70% of identified caregivers reporting being overweight/obese. For those individuals who did not identify as a caregiver, 67% reported being overweight/obese. I found a weak association between informal caregiving and being overweight/obese. These findings support the existing literature that the demands of being an unpaid caregiver may have a potentially negative impact on a caregiver's health outcomes, including the risk of developing adiposity (see Lacey et al., 2018; Whitley & Fuller-

Thomson, 2017). The related BRFSS survey question asked about providing care during

the past 30 days, and this may not have captured all respondents who were caregivers

during their lifetime. This may limit the insights drawn from the results of this study into

the associations between providing informal caregiving services for family and friends

and being or becoming overweight or obese. Even though only 20% of the respondents

identified a caregiver role, this number exceeds the current statistics that indicate that a

minimum of 43.5 million individuals (approximately 13% of the population) typically

provide caregiving duties in a 12-month period across the United States, suggesting that

the 20% of BRFSS survey respondents (who identified as caregivers) in this study may

be more representative of the population of caregivers in the United States than the

survey results initially indicated (see Berry et al., 2020).

Length of Care Provided and Being Overweight or Obese

Concerning the length of time as a caregiver and being overweight/obese, I found

that 51.2% of the 2,842 respondents identified as being a caregiver for more than 2 years.

In addition, of the respondents who reported being overweight/obese, 52% of those

respondents also provided care for 2 years or more. On the other hand, 48.7% of

respondents identified as being a caregiver for a shorter period of time, specifically less

than 2 years, with 48.1% reporting being overweight/obese. While the raw data indicated

that there was a difference in being overweight/obese based on length of time care had

been provided, the results of a chi square test of association and strength of association

test suggested there was no significant relationship between the length of time as a

caregiver and a person's overweight/obesity status.

The findings of this study add to the knowledge in the field because I examined length of time as a caregiver and obesity status as opposed to looking at specific caregiving duties and stressors associated with such work. Previous studies indicated that caregiver duties and the intensity of caregiver responsibilities were associated with becoming overweight/obese, but other researchers did not examine whether the length of time as a caregiver played a role in obesity prevalence (Chiao et al., 2015; Hajek et al., 2017). Combining the research efforts undertaken in this study with the existing literature adds valuable insights into the ways in which caregiving and obesity status are interrelated, not so much due to length of time, but rather to the type and/or amount of work the caregiver provides.

General Health Status, Providing Care, and Being Overweight or Obese

The addition of general health as a moderator to the relationship between providing care and being overweight/obese increased the odds ratio by 12%. A caregiver with a lesser health status is more likely to become overweight/obese as compared to a caregiver with a better health status. These findings are supported by the existing literature that suggests that providing care has the potential to compound preexisting caregiver health issues (see Bom et al., 2019; Plichta, 2018; Whitley & Fuller-Thomson, 2017).

Geographic Location, Providing Care, and Being Overweight or Obese

Adding geographic location as a moderator to this study was not statistically significant because the odds ratio only increased 1.1% when this factor was included. However, because 92% of respondents identified their geographic location as urban

compared to only 8% as rural, the results may not be representative of the true connection between where a person lives, their caregiver status, and obesity prevalence. Ultimately, there are still too many unanswered questions about geographic location to provide an adequate understanding of the ways in which caregiving and obesity status are influenced by the urban/rural environment using the results of the current study.

Demographic Variables Analysis

In this subsection, I detail the analysis of descriptive statistics to further define the survey respondent population of the study. Of the three states analyzed, most respondents resided in Georgia. In addition, 53.8% of respondents were women, 67.3% of were college educated, 41.7% were employed full time, and 31% reported an annual salary of $75,000 dollars or more per year (see Table 5). From the health outcomes perspective, 76% of the respondents reported some level of exercise, 84% reported no history of diabetes, and 26.8% were nonsmokers (see Table 4). Another insightful demographic factor is that 69.9% of respondents identified as White only, non-Hispanic. While the race/ethnicity breakdown represented in the 2018 BRFSS survey data used for this study aligned with the national statistics on the population subsets of race and ethnicity in the United States (see U.S. Census Bureau, 2017), more work should be done to ensure that higher numbers of racial and ethnic minority populations are included in future research to gain a more robust understanding of the unique dynamics that may exist among each racial and ethnic group.

Alignment With the Theoretical Framework

The core components of the SCT focus on the relationship between a person and their environment (Bandura, 1986), which I sought to observe in this study. Based on the results of the analysis, being a caregiver and the intensity of the home environment demands in which a caregiver works and lives could indicate a potential reciprocal relationship between environmental stressors and health outcomes as the SCT would suggest. However, as previously noted, it is uncertain if the actual geographic location of the caregiver's residence is a factor that influences the relationship between caregiver status and being overweight/obese. Finally, the analysis suggested that being a caregiver could possibly decrease self-care and self-efficacy behaviors depending on the intensity of the care provided. Therefore, future studies should delve more in depth into the interplay of these relationships on health outcomes.

Limitations of the Study

There are multiple limitations that must be considered when implementing the results of this study into public health decision making. First, given that this was a cross-sectional study using a secondary data set, the findings were limited to observing different associations between the variables that were available rather than being able to definitively identify specific cause-and-effect relationships that may have existed between being a caregiver and obesity status. It is also important to recognize that the data were only collected from a single year, were survey-based, and the responses were self-reported. In addition, while most of the demographic information mirrors national statistics (see U.S. Census Bureau, 2017), there remains a concern that certain groups are

overrepresented while others are severely underrepresented. For instance, as was previously mentioned, the geographic data primarily represented urban residents and the majority of respondents from the three states used for analysis resided in the southern state of Georgia, raising concerns that rural populations and other regions may have been misrepresented. Finally, while the national statistics identified that low-income individuals and ethnic and racial minorities are sectors of the population at highest risk of becoming obese (Ward et al., 2019), the secondary data set used in this analysis underrepresented these subsets of the population, limiting the ability to generalize the findings to a national scale.

Recommendations

In this study, I focused on caregiver status and length of time as a caregiver with geographic location and general health of the caregiver examined as potential moderators of this relationship. While discrepancies may exist between the results of this study, the national statistics on obesity, and the findings of previous caregiving studies, an important insight gained from this analysis was that the intensity of caregiver responsibilities mattered much more than the length of time as a caregiver in placing individuals at a higher risk of becoming overweight/obese. Based on these results, I recommend that future studies, public health interventions, and health care policy decisions incorporate and reflect the unique demands placed on informal and unpaid caregivers. Because this subset of the population plays such an important societal role in maintaining the health and well-being of care recipients, developing innovative programs

and services for this underrepresented group will be integral in ensuring a healthier population overall.

Implications for Professional Practice and Social Change

Caregiving and obesity represent two complex, multi-factorial areas of public health. With both caregiving and obesity trends rising across the United States (Flinn, 2018; Hales et al., 2017; Livingston, 2018; Warren et al., 2018), public health professionals are in a strong position to further investigate root causes of obesity with a special emphasis on caregiving and advocate for specific needs associated with being an unpaid, informal caregiver. One such way to continue research efforts related to this subset of the population is to incorporate a community-based participatory research approach in local communities to ensure that unique needs can be met. By incorporating qualitative data with existing quantitative data, public health professionals should be able to garner a more in-depth understanding of caregiver needs. One way to gain more quantitative data would be for public health professionals to advocate for the CDC to consider moving the BRFSS caregiver module from the optional section to the required section in future surveys. Based on the combined knowledge gained through these strategies, public health professionals should have the necessary tools for targeting interventions, influencing policy decisions, and acquiring important funding to improve caregiver health and well-being.

Moving forward, it will be important to gather more data from the rural population in order to gain additional insights in the ways these factors interact with and influence one another. It will also be important to expand the existing definitions of urban

and rural geographic locations while simultaneously using geographic information systems mapping to gain a clearer understanding of specific pockets of need, allowing for a focus on zip codes, neighborhoods, and even blocks within a community (see Cohen et al., 2017).

Conclusion

This examination of caregiver status, length of time providing care for a family member or friend, and being overweight/obese provided meaningful insights for future public health endeavors. I found a relationship between being a caregiver and being overweight/obese, regardless of the length of time spent caring for another person. While general health of the caregiver was found to moderate the relationship between being a caregiver and being overweight/obese, geographic location was not found to moderate the relationship in this study analysis. However, these results need to be interpreted cautiously based on the demographic characteristics of the BRFSS 2018 survey respondents in the states of Georgia, Oregon, and New Jersey.

It is imperative that a continued research focus remains on the important role of informal caregiving. Building on previous obesity research efforts and the findings of this study and given that this study occurred in the midst of the COVID-19 pandemic (which highlighted the important role of caregiving across society as more individuals were forced into the role of informal caregiving either for relatives or friends even while attempting to continue a career and/or to balance increased child care/teacher duties during school closures), public health professionals and local communities have the opportunity to develop strategic partnerships for further exploring the integral

relationships between informal caregivers and the prevalence of obesity. Further

exploring the multiple demands on caregivers and on the potential negative health

outcomes for those who provide care for family members or friends may result in new

innovative approaches for how public health and health care professionals address the

obesity epidemic within the United States.

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