# Yoga as a Women's Population Health Intervention

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2019

Abstract

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by

Lisa Clow

MA, The George Washington University, 1997

BS, Indiana University of Pennsylvania, 1990

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

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## Abstract

Women's mortality rate in the United States has increased in almost every age group in the past several years. However, more women in the United States are choosing yoga as a complementary health approach to improve general well-being. Thus, research on yoga and other factors that affect women's health in the United States may inform public health initiatives to address the health disparities in women's mortality rate. Grounded in the health belief model, the purpose of this study was to explore whether the factors of practicing the components of yoga, doctor's recommendation for increased physical activity, body mass index (BMI) categories, hypertension, high cholesterol, age, and occupation predicted the self-rated health of women. This cross-sectional, secondary analysis of the 2017 National Health Interview Survey included 14,464 female respondents, and ordinal logistic regression analysis was used to examine the data. The results showed that self-reported participation in yoga, breathing as a part of yoga, and meditation as a part of yoga was associated with higher self-rated health. Additionally, participants with healthy weight BMI, teachers, and participants who did not receive recommendations for increased physical activity and did not have hypertension or high cholesterol were more likely to report better self-rated health. Based on the results of this study, public health researchers may continue to explore the effects of yoga on women and how a yoga-based population health intervention could help women in the United States live longer and healthier lives.

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# Dedication

I want to dedicate this work to all the women in this world who have the power within to achieve health and well-being through the inquiry of yoga.

# Acknowledgments

I want to thank my committee chair, Dr. Simone Salandy, and committee member Dr. Julia Leischner, for their unrelenting support, guidance, and encouragement. I would also like to thank Dr. Mary Garbowski for her feedback and guidance. Thank you to Dr. Zin Htway for his valued time and expertise.

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# Chapter 1: Introduction to the Study

Public health's interest in the prevention of chronic disease and the development of interventions for population health has increased over the past several decades, with more recognition of the importance of social and behavioral science in addressing prevention (Schneider, 2011). Since the early 1950s, the expansion of public health's consideration of psychosocial, sociocultural, and behavioral variables related to the mortality rate in the United States has led to the development of a population-based approach to disease prevention (Schneiderman & Speers, 2013). The Centers for Disease Control and Prevention (CDC) identified the use of data in public health assessments as an essential component in population health interventions (Schneider, 2011). The National Center for Health Statistics (NCHS), the CDC, and the Census Bureau developed the National Health Interview Survey (NHIS) for the collection of data to identify trends of disease and risk factor trends in the U.S. population (Schneider, 2011).

In 2017, the NCHS added adult complementary health questions as a part of the adult complementary and alternative medicine supplement for the NHIS (NCHS, 2018). The adult complementary health section included inquiry on complementary health approaches (CHAs), and participants answered questions about their use of yoga over the past 12 months, breathing as a part of yoga, and meditation as a part of yoga. Yoga was one of the top 10 CHAs used in the United States that promoted a holistic approach to health (National Center for Complementary and Integrative Health [NCCIH, 2018). Over 14% of U.S. adults practiced yoga in the past year (Clark, Barnes, Black, Stussman, & Nahin, 2018). Practicing yoga has increased general well-being and can reduce stress,

increase positive mental health, and promote physical activity (NCCIH, 2018). Yoga has also relieved symptoms of chronic diseases such as cancer, COPD, obesity, heart disease, and diabetes (NCCIH, 2018). Additionally, yoga has reduced anxiety and depression due to medical conditions and various circumstances in life (NCCIH, 2018). Because most yoga studies have used small sample sizes that are not generalizable, with a majority of higher educated, non-Hispanic White women practicing yoga (NCCIH, 2018), I used the 2017 NHIS data to explore the relationship between trends in women's use of yoga, breathing as a part of yoga, and meditation as a part of yoga, hypertension, high cholesterol body mass index (BMI), age, teaching as an occupation, being told to increase physical activity, and self-rated health (SRH) as a measure of well-being.

Primary prevention in public health is focused on the shift from the treating disease to changing societal norms that promoted well-being (Cohen & Chehimi, 2012). The potential positive social change implications of this study include primary prevention recommendations for women's population health through the practice of yoga, breathing, and meditation. Primary prevention implications also include the recommendations for policies and future public health research to further explore yoga practice as a women's population health intervention.

This chapter includes the background of women's health in the United States and the benefits of yoga as a population health intervention. This chapter also consists of the public health problem, the purpose of this study, the research questions, and the theoretical framework. Further, the chapter includes the definition of the terms, the major assumptions, and delimitations, as well as the significance of the study.

## Background

Compared to men in the United States and women in other high-income countries, women in the United States experience health disparities and higher rates of chronic disease (The National Institute of Health Office of Research on Women's Health, 2019). Women's mortality rate in the United States has increased in almost every age group in the past several years due to injuries, suicide, cancer, and heart disease (NCHS, 2018). Social cohesion has been strongly associated with mortality rate, and mortality rates vary by state (Montez, Zajacova, & Hayward, 2016). Therefore, the National Prevention Council created a strategic plan to improve the health of citizens and to reduce the cost of health care in the United States (Department of Health and Human Services, 2011). Priorities for the plan included addressing the declining well-being of U.S. citizens and closing the gap in health disparities as well as improving the mental and emotional well-being of Americans. The four strategic directions of the plan were focused on communities that promote wellness through prevention, building prevention-focused health care, empowering people to make healthy choices, and eliminating health disparities in the United States (Department of Health and Human Services, 2011).

Recent studies have focused on yoga to rehabilitate patients with chronic disease, increase physical activity, reduce the effects of stress on mental health, and improve general wellness (NCCHI, 2018). After analyzing data from the 2012 NHIS, over 94% of participants who practiced yoga did so for general well-being compared to those who practiced yoga for a specific health reason (Stussman, Black, Barnes, Clarke, & Nahin, 2015). Most of the participants believed that a yoga practice prevented disease and

promoted wellness (Stussman et al., 2015). Yoga participants reported reduced stress, higher motivation to be physically active, higher self-reported health outcome, and better emotional well-being (Stussman et al., 2015). Additionally, those suffering from work-related stress have reported lower scores in health-related quality of life and traditional yoga practice may help to prevent mental health issues related to burnout in the workplace (Grensman et al., 2018). Further, women who practiced yoga have had more positive health behaviors than nonpractitioners and were more likely to be physically active and eat healthier (Cramer, Sibbritt, Park, Adams, & Lauche, 2017). Women who practiced yoga during and after cancer treatment also scored higher on the World Health Organization Well-Being questionnaire (Haier, Duda,& Branss-Tallen, 2018).This study adds to the body of research that explores how practicing all the components of yoga could increase women's health.

## Problem Statement

The 10 essential public health services include providing research-based recommendations for the increase of health-related quality of life and the promotion of health behaviors that prevent chronic diseases (CDC, 2014). The surgeon general stated that emotional well-being and mental well-being was a focus on the National Prevention Strategy (Department of Health and Human Services, 2011). The National Prevention Strategy was designed as a part of the Affordable Care Act and informed stakeholders as well as policymakers on ways to increase the well-being of Americans (Department of Health and Human Services, 2011).

The state of population health in the United States challenges public health scholars because of a decline of personal well-being (Seib et al., 2014; Shern, Blanch, & Steverman, 2016). Women's mortality rate in the United States has increased over the past several years (NCHS, 2017). Women in the United States have lower life expectancy than other high-income countries, especially those under 65 years old (Ho & Hendi, 2018). Drug overdose, cardiovascular disease, and respiratory disease are contributing factors in the decline in life expectancy (Ho & Hendi, 2018). Although chronic disease continued to persist as the top reasons for early death among women, deaths due to unintentional injuries, drug overdose, and suicide have increased as well (NCHS, 2018).

The number of U.S. adults who used yoga as a way of improving health has increased, and over 14% of the adult sample in the 2017 NHIS answered *yes* to the question "participated in yoga in the past 12 months" (Clark et al., 2018). Additionally, more women chose yoga as a health-promoting behavior, and there was increased use of meditation as a part of yoga in the 2017 NHIS data (Clark et al., 2018). Since a growing number of Americans used yoga as a CHA, there is a need for more public health-focused studies on the use of yoga as an effective health and well-being promoting behavior (Clark et al., 2018). Because yoga promotes positive health behaviors and improved health outcomes, public health initiatives should explore yoga as a potential population health intervention (Leischner, 2015). From a public health perspective, yoga researchers should design generalizable studies (Patwardhan, 2017).

This study filled a gap in the literature by exploring the association between the independent variables of health outcomes, yoga as health behavior, and dependent

variable SRH in women. Research has indicated that SRH is a valid predictor of mortality and measure of health (Assari, Lankarani, & Burgard, 2016). Thus, the SRH questions used in surveys such as the NHIS were appropriate for monitoring population health as a measure of the general perception of health and health-related quality of life (Hays, Spritzer, Thompson, & Cella, 2015). By identifying the proportional odds and the statistical significance of the model in using the factors to predict the dependent variable, this study could guide future research and provide recommendations for designing yoga-based women's population health interventions that promote well-being and positive health behaviors.

## Purpose of Study

Generalizable yoga research has the potential to influence the design of women's population health interventions and prevention programs in the United States (NCCIH, 2018). The purpose of this study was to explore the relationships between the factors of practicing yoga, breathing, and meditation, hypertension, high cholesterol, being told to increase physical activity, BMI, teacher occupation, the covariate of age, and the dependent variable of SRH. Significantly statistical effects found to predict the dependent variable in this study could inform future studies that could test for causality with more sophisticated statistical analysis. The outcomes of this study could also be of interest to public health scholars, policymakers, and other stakeholders in health care interested in increasing population health and studying CHA for prevention and intervention. This research also fills a gap in understanding the association between the components of yoga, health outcomes, age, occupation, and the odds of predicting SRH in women.

Public health practitioners could replicate this study for future insight on yoga as a population health intervention. Positive social change can result from the development of yoga-based public health promotions.

## Research Questions and Hypotheses

Research Question 1: Are the factors practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, teacher occupational status, and the covariate age factors that predict self-rated health?

$H_1$1: There is an association between practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, teacher occupational status, age, and self-rated health.

$H_0$1: There is no association between practicing yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, teacher occupational status, age, and self-rated health.

Research Question 2: Are the factors told to increase physical activity past 12 months, BMI, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga factors that predict self-rated health?

$H_1$2: There is an association between told to increase physical activity past 12 months, BMI, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

$H_0$2: There is no association told to increase physical activity past 12 months, BMI, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

Research Question 3: Are the factors had hypertension, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga factors that predict self-rated health?

$H_1$3: There is an association between had hypertension, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

$H_0$3: There is no association between had hypertension, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

Research Question 4: Are the factors had high cholesterol, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga factors that predict self-rated health?

$H_1$4: There is an association between had had high cholesterol, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

$H_0$4: There is no association between had high cholesterol, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

This study included the 2017 NHIS data to explore the odds of predicting the dependent variable women's SRH—health better/worse/same, compared with 12 months ago—and the statistical significance of the model using the independent variables of

hypertension, high cholesterol, recommendation to increase physical activity, BMI, practicing the components of yoga, age, and teaching as an occupation.

## Theoretical Framework for the Study

The theoretical framework used in the study was the health belief model (HBM). The HBM may explain the use of yoga as a CHA through the constructs of perceived susceptibility and perceived benefits for well-being (Skinner, Tiro, & Champion, 2015). If the perceived benefits of the intervention outweigh the perceived risks of the consequences of the health risk, the individual acts on health behavior (Skinner et al., 2015). Through the lens of HBM, I explored the choice of participating in yoga for the health benefits. HBM constructs have been used in a variety of women's health studies to explain the increase in yoga participation. For example, Atkinson and Permuth-Levine (2009) stated that the HBM explained why women chose yoga as a health behavior that would lead to a positive health outcome and the barriers that might keep them from participating. Kabiri, Ali, and Zulnaidi (2018) also used the HBM to explain that the noncompetitiveness of yoga and perceived social benefit may explain why females predominantly practice modern yoga, though cost of classes was a barrier to participation. The constructs of perceived benefits and perceived risks are discussed later in Chapter 2.

## Nature of the Study

This quantitative study involved a correlational, cross-sectional design to analyze secondary data from the 2017 NHIS. The correlation design was most appropriate when looking for associations, and the cross-sectional aspect pertains to the dataset collection. The reason for using secondary data for this study includes the low cost, time efficiency,

and the purpose of the original data collection. The methodology of this study included the quantitative ordinal logistical regression in SPSS to provide an accurate explanation of the associations between the factors, the covariate, and dependent variable. The ordinal logistical regression explains the odds of predicting the level of SRH and the statistically significant effect of the model using the factors of practicing the components of yoga, the health outcomes of hypertension, high blood pressure, BMI, doctor's recommendations to increase physical activity, teacher occupation, and the covariate was age.

## Definitions

*Breathing exercises:* May involve actively controlling the was air is drawn in or the rate or depth of breathing (NCCIH, 2018).

*Ethics of yoga:* Guideline for yoga practice:

1. Yama: Sanskrit word for restraints
2. Niyama: Sanskrit word for observances
3. Asana: Sanskrit word for body postures or poses
4. Pranayama: Sanskrit word for yogic breath or breath control
5. Dhyana: Sanskrit word for meditation
6. Dharana: Sanskrit word for increased focus and attention
7. Samadhi: Sanskrit word for the state of bliss. (Taneja, 2014)

*Health-related quality of life:* Physical or mental aspects that describe a person's overall quality of life (CDC, 2018c).

*Meditation:* A mind and body practice that increases calmness and physical relaxation that enhances overall health and well-being (NCCIH, 2018).

*Well-being:* A measure of how a person feels about their state of physical, emotional, and social health (CDC, 2018c).

*Yoga practice:* An ancient practice that promotes physical well-being and mental well-being (NCCIH, 2018).

## Assumptions

The first assumption was that the reason that individuals practice yoga, breathing, and meditation is for improving or maintaining health and increasing well-being. The second assumption was that yoga practice could vary in type or style of yoga. A third assumption was that the amount of yoga practiced could vary among participants. These assumptions were necessary to explore the relationships among the variables in this study.

## Scope and Delimitations

The scope of this study addressed the potential use of yoga as a women's population health intervention from a public health perspective. The topic of this study was chosen as an exploration into the increasing participation of yoga by women in the United States and the benefits that these women perceive as SRH. The results may lead to more in-depth yoga research as well as the adoption of yoga as a women's population health promotion.

## Limitations

The boundaries of this study were limited to the U.S. population who participated in the 2017 NHIS. Because of the correlation design of the study, results did not describe causal relationships. The results are generalizable for women in the United States, but

there may be other confounding variables. Additionally, because of the single point collection, the data could be subject to bias and threaten internal validity. Another limitation may be the comprehension of the survey participants of what yoga practice implies and low health literacy.

## Significance

This research could change the way public health scholars approach women's population health promotion. Because more women are participating in yoga as a way of increasing well-being and health-related quality of life, public health researchers may continue to explore the effects of yoga on women and how a yoga-based population health intervention could help women in the United States live longer and healthier lives. The goal of public health is to improve population health through the research-based education of the stakeholders and recommendations for policy changes (Schneider, 2011). This study could further the progress of public health in raising the level of population health.

## Summary

Chapter 1 provided an introduction to the study and the background of the issue of declined well-being. Chapter 1 also included the discussion of the increased mortality rate of women in the United States and the increased participation in yoga by U.S. women. The purpose of the study was to explore how the factors of health status, recommendations for increased physical activity, BMI, teaching as an occupation, and the covariate of age relate to SRH using the HBM as a framework.

Chapter 2 presents the scope of the state of women's well-being in the United States, the benefits of yoga on well-being, the literature search strategy, and the literature review. The chapter also contains HBM assumptions and theoretical constructs. Chapter 2 also includes examples of yoga research in the promotion of health and well-being.

# Chapter 2: Literature Review

## Introduction

From 2014 through 2016, life expectancy in the United States decreased by 0.3 years (NCHS, 2017). The National Institute of Health Office of Research on Women's Health (2019) stated that there were health issues specific to women in the United States that were not common in other high-income countries such as higher rates of drug overdoses, suicide, heart disease, and cancer. More research on factors that affect women's health in the United States could inform public health initiatives that could address the health disparities in women's mortality rate (The National Institute of Health Office of Research on Women's Health, 2019). For example, yoga was the most popular CHA for chronic disease prevention in the 2017 NHIS survey (Clark et al., 2018). More women have chosen to practice yoga for general health purposes than previous years (Clark et al., 2018). The purpose of this study was to explore the associations between practicing yoga, breathing, and meditation, recommendations for increased physical activity, health outcomes, age, occupation and SRH among women in the United States through the lens of public health.

## Literature Search Strategy

The search engines and library databases used in the literature review included Google Scholar, MEDLINE, CINAHL, ProQuest Health and Medical Collection, PubMed, and Thoreau within the Walden University Library, CDC.gov, and NIH.gov. Key search terms included the following: *well-being or wellbeing or well being, yoga, yoga and meditation, yoga and breathing, yoga and women's health, yoga and chronic*

*disease, yoga and heart disease, yoga and fall prevention, yoga and pain management, yoga and suicide prevention, yoga and post-traumatic stress disorder, women's health, mindfulness, mindful movement, work-related stress and well-being or well being or wellbeing, yoga and work-related stress, SRH and well-being or wellbeing or well being, health belief model, health belief model and yoga, health belief model and health behavior, health belief model,* and *chronic disease*. The scope of the literature review was current peer-reviewed journals, research articles, and texts written between 2014 to 2019 in the area related to well-being, yoga and health, women's health, and yoga to prevent and treat chronic disease. Seminal research included original research on the health belief model and books written on yoga practice, yoga ethics, and the Yoga Sutras of Patanjali.

## Health Belief Model

The theoretical framework for this study is the HBM. In the 1950s, public health scholars used the HBM to explain why people were not adhering to recommendations for chronic disease prevention (Skinner et al., 2015). Originating from the cognitive theory, the HBM involves constructs to explore why people choose to follow prevention protocols or treatments for chronic diseases (Skinner et al., 2015). The HBM considers individual factors such as age and socioeconomic background along with the personal belief of chronic disease risk as well as the belief of benefit from a change in behavior (Skinner et al., 2015).

### Major Assumptions of the Health Belief Model Constructs

HBM provided a theoretical lens through which I explored how those who practiced yoga, breathing, and meditation perceive the benefits through SRH and what

motivates them to participate in yoga. The HBM construct of perceived benefits is the second strongest predictor of health behavior change (Sulat, JPrabandari, Sanusi, Hapsari, & Santoso, 2018). The HBM suggests that a negative perception of a health risk increases the chances of participating in health-promoting behavior (Skinner et al., 2015). Additionally, when the perceived benefits of participating in a health behavior outweigh the barriers, the person changes the health behavior (Skinner et al., 2015).

**Application of Health Belief Model in Previous Studies**

Many researchers have used the HBM in studies to examine health behaviors. For example, Park, Clement, Hooyman, Cavalie, and Ouslander (2015) used the HBM in the study of complementary and alternative medicine for managing chronic pain among 215 women and 66 men with a mean age of 74. Park et al. used the arthritis-related health belief instrument, a modified HBM tool, to measure perceived severity, perceived susceptibility, perceived barriers, and perceived benefits. Park et al. stated that the arthritis-related health belief instrument could predict the use of complementary and alternative medicine for chronic pain among an ethnically diverse population.

Researchers have also used the HBM to examine practicing yoga as a health behavior. Atkinson and Permuth-Levine (2009) used HBM to explain why 37 female and 13 male participants chose to begin practicing yoga and the perceived barriers that prohibited the practice. Participants' perceived barriers included the inconvenience of the location of classes and the cost, and the perceived benefits of yoga included health promotion, increased psychological health, and the comparison of yoga to conventional treatment for the disease (Atkinson & Permuth-Levine, 2009). Kabiri et al. (2018) also

used the HBM to investigate the perceived benefits and barriers of yoga practice among 165 female and 32 male college students and found that perceived barriers include time and cost. Further, Wertman, Wister, and Mitchell (2016) used the HBM to study the differences in practices between 352 female and 100 male adults ranging from 40 to 82 years old who participated in yoga. The HBM supported the premise that the participants practiced yoga based on the perceived benefits and the protective factors from diseases. The barriers were the cost-benefit and the lack of yoga classes available. The path in which a person initiated a yoga practice for self-care was different depending on age, gender, socioeconomic background, and exposure to media cues, with middle-aged participants reading about the benefit of yoga and older participants going with family and friends (Wertman et al., 2016).

Research has also suggested the use of the HBM to design prevention programs. Hoseini, Maleki, Moeini, and Sharifirad (2014) used the HBM to study 92 women with the mean age of 41 years old not diagnosed with hypertension but had family members with the diagnosis. Hosieni et al. used the HBM constructs of perceived susceptibility and perceived severity to develop a curriculum on the risks of hypertension and the benefits of regular physical activity. All the participants completed a physical activity questionnaire before and after the intervention. After attending three educational sessions, the intervention groups mean scores of physical activity, leisure, and sports component of the questionnaire increased significantly, whereas the control groups scores had no statistical significance.

## Literature Review Related to Key Concepts

### Women's Mortality Rate in the United States

In 2016, life expectancy in the United States was 84 years for Hispanic women, 81 years for non-Hispanic White women, and 78 years for non-Hispanic Black women (NCHS, 2017). Since 2013, death rates for women between 25 to 44 years old have increased by 5% each year (NCHS, 2017). Over the past 10 years, the death rate for women between the age of 45-65 has increased by almost 1% each year (NCHS, 2017).

The top four reasons for mortality in women between the age of 25 to 34 are unintentional injuries, cancer, suicide, and heart disease (NCHS, 2017). Although the mortality rate for unintentional injuries and suicide decreases between 35 to 44 years old, the rates of death due to cancer and heart disease increases (NCHS, 2017). Additionally, women between the age of 45 and 54 are vulnerable to cancer, heart disease, unintentional injuries, and chronic liver disease, and women 55 to 64 have more risk of death due to chronic lower respiratory disease than chronic liver disease (NCHS, 2017). Although mortality rates due to cancer and heart disease have decreased over the past 10 years, death caused by drug overdose, liver disease, and suicide has increased (NCHS, 2017). Drug overdose deaths among women 25 to 34 years old has increased at a rate of almost 20% each year from 2014 to 2016 (NCHS, 2017). Death due to suicide increased among women 25 to 64 years old over the past decade with the highest rates among 45 to 64 year olds (NCHS, 2017).

**Unintentional injuries.** The leading cause of death among women under the age of 42 years old is unintentional injuries (Mack, Peterson, Zhou, MacConvery, & Wilkins,

2017). For example, fatal falls were the most common cause of injury death for women of any age and the number one cause of death for women over the age of 70 (Mack et al., 2017). In 2015, medical treatment for women who experienced a fatal fall cost over $330 million, and women's nonfatal fall treatment totaled over $22 billion (Burns, Stevens, & Lee, 2016). Women were more likely to require medical treatment for falls, and women over the age of 84 accounted for one-third of the injury treatment costs (Burns et al., 2016). Additionally, the demographic shift of an older population could increase healthcare expenditure (Smith, Mross, & Christopher, 2017). The National Center for Injury Prevention and Control (2015) stated that those who suffered from a fall were more likely to fall again. Some risk factors for falling are muscle weakness, balance issues, chronic disease, and inactivity (National Center for Injury Prevention and Control, 2015). Understanding the community's needs and choosing an evidence-based fall prevention program and recruiting participants are steps to implementing a successful program (National Center for Injury Prevention and Control, 2015). Public health leaders can partner with community-based organizations to research, develop, and implement appropriate prevention strategies and programs (National Center for Injury Prevention and Control, 2015).

Unintentional poisoning due to drug overdose has been the second leading cause of injury death among women of all ages in the United States (Mack et al., 2017). The opioid epidemic and the medical treatment for pain has increased number of unintentional poisoning deaths in the United States (Tick et al., 2018). The National Institute on Drug Abuse (2018) stated that over 19 million women in the United States used an illicit drug

in the past year and that women used the drugs to control weight, pain, exhaustion, and self-treatment of mental health issues. The medical treatment of pain cost over $560 billion each year, and more than 100 million Americans have suffered from chronic pain, which decreases work-related output, physical and mental well-being, and social relationships (Tick et al., 2018). Women of every race are more likely to suffer from chronic pain and more likely to receive inadequate diagnosis and treatment of pain (Tick et al., 2018). Though women tended to use less of a drug, they became addicted over less time (National Institute on Drug Abuse, 2018). Women have also experienced greater physiological changes and are more likely to die from an overdose (National Institute on Drug Abuse, 2018). Solutions to the opioid and pain epidemic can include alternative, nonpharmacological research-based treatments (Tick et al., 2018). Yoga could be a viable alternative to pain treatment, but future studies should include more rigorous research (Tick et al., 2018).

**Suicide.** Suicide was the fourth leading cause of injury death among women of all ages (Mack et al., 2017). Suicide rates in the United States increased each year from 1999 to 2006 (NCHS, 2017). From 2006 to 2016, suicide was the third leading cause of death for those under the age of 45 and the eighth leading cause of death for those 45 to 64 years old (NCHS, 2017). Suicide risk factors include problems in relationships, drug abuse, physical health, mental health, legal issues, financial stress, and housing stress (CDC, 2018d). Learning to cope with stress, along with activities that promote social connections could reduce the risk of suicide (CDC, 2018d). Communities and workplaces

can also create healthy environments that promote a sense of belonging to reduce the risks factors for suicide (CDC, 2018d).

**Chronic disease.** Chronic disease is another leading cause of death for women. About 7.5 % of women between the age of 45 and 54, 12% of women between the age of 55 and 64, and 18% of women over the age of 64 have experienced cancer (NCHS, 2017). The overall incident rates in women have remained steady since 1999, though death rates due to cancer in women have declined about 1.4% each year (Cronin et al., 2018). However, although the rate of incidents of cancers not associated with obesity has decreased since 2005, incidence rates for most cancers associated with obesity have increased (Steele et al., 2017). Additionally, endometrial, ovarian, and postmenopausal breast cancer incidence rates increased in women in 2014 (Steele et al., 2017). The CDC (2018b) stated that healthy choices such as abstaining from tobacco use, limiting alcohol consumption, and maintaining a healthy weight reduced the risk of cancer.

Further, the number of deaths due to heart disease in women increased with age from 2006 to 2016 (NCHS, 2017). Despite educational campaigns, most women have been unaware of the signs and symptoms of a heart attack and have died before they arrived at a hospital for care (Murphy, Alderman, Harvey, & Harris, 2017). Women are also more likely to experience a heart attack during times of functional or emotional stress and could have atypical signs such as neck pain or nausea (Murphy et al., 2017). The risk factors for death caused by cardiovascular heart disease include age, smoker status, high systolic blood pressure, diabetes mellitus, family history of premature myocardial infarction, and high HDL cholesterol (Leening et al., 2019). Other risk factors

for heart disease include overweight, obesity, poor diet, physical inactivity, and excessive alcohol intake (CDC, 2017a). Treatment for diagnosed heart disease in women can include counseling on adopting healthy behaviors that lower BMI, reduce blood pressure, reduce glucose levels, lower cholesterol levels, and lower resting heart rate (Murphy et al., 2017). Learning ways to cope with stress could also reduce the risk of heart disease (CDC, 2017a).

The number of deaths due to chronic liver disease and cirrhosis in women over the age of 25 to 34 showed the greatest increase from 2006 to 2016, and the overall rate increased by almost 3% among women each year (NCHS, 2017). Deaths due to chronic liver disease in women 55 to 64 years old also increased over the past decade (NCHS, 2017). Postmenopausal women with decreased estrogen levels and increased testosterone as well as those with the polycystic ovarian syndrome are at a higher risk for nonalcoholic fatty liver disease (Hörist-Kollmann, & Strametz-Juranek, 2018). Additionally, a diet of foods high in fructose, saturated fats, and trans-fats is associated with nonalcoholic fatty liver disease (Ferolla et al., 2015). Both the restriction of carbohydrates, fats, increased exercise, and a 3 to 5% reduction of body weight decreases the risk of nonalcoholic fatty liver disease (Ferolla et al., 2015).

Finally, COPD was the fourth leading cause of death among women in 2016 (NCHS, 2017). Annual direct costs for patients with COPD was about $10,000 annually with societal costs of absenteeism, disability payments, and mortality was over $30, 000 per patient, suggesting the need for alternative resources to lower expenditures (Foo et al., 2016). The prevalence of COPD has varied by the state with the highest at about 10%

of the population (CDC, 2018b). Treatments that include self-management plans have been associated with increased health-related quality of life and reduced the number of respiratory-related hospital visits (Lenferink et al., 2017). COPD patients suffer from poor fitness, sedentary lifestyle, decreased cardiovascular function, and social isolation, making increasing physical activity an important part of a self-management plan (Corbridge & Nyemhuis, 2017).

**Well-Being and Yoga**

Improving population health is a public health challenge. One of the 10 essential public health services is informing, educating, and empowering people about health outcomes that could increase the quality of life and prevent chronic diseases (CDC, 2014). Well-being is an integration of the self-perceived state of mental, physical, and social health that describes overall life satisfaction (CDC, 2018a). Public health scholars could use measures of well-being to guide population health promotion and disease prevention interventions.

The decline of personal well-being is a contemporary public health issue (Seib et al., 2014; Shern et al., 2016). The surgeon general identified emotional well-being and mental well-being as one of seven areas of focus for increased population health (Department of Health and Human Services, 2011). Emotional well-being encompasses the measure of various psychometrics, including levels of happiness, work-related satisfaction, and social purpose, which are linked with health outcomes (Feller et al., 2018). A combination of subjective well-being and objective measures such as

employment status and income could guide public health scholars in the development of health promotion and surveillance systems (CDC, 2018c).

Taneja (2014) stated that practicing the eight limbs or ethics of yoga, which include the postures, breathing, and meditation increased the level of an individual's health. The Yamas, restraints of yoga, included (a) non-violence, (b) truthfulness, (c) non-stealing, (d) nonexcess, and (e) non-possessiveness, and guided the yogi's interactions with the world around them (Taneja, 2014). The Niyamas, observances of yoga, included (a) purity, (b) contentment, (c) self-discipline, (d) self-study, and (e) surrender, and guided the yogi's interaction with the self (Taneja, 2014). The postures, also known as asanas, increased the stamina and focused the attention to the proper alignment of the bones and joints (Taneja, 2014). Taneja (2014) said that there were many types of pranayama or yogic breathing; participants experienced the ability to control the mind, increased concentration, and shifted the energy flow throughout the body. Meditation, also known as Dhyana, increased concentration and focus, or Dharana (Taneja, 2014). Samadhi was the state of bliss, calm in the eye of the storm, or connection with the divine (Taneja, 2014) Therefore yoga supported the increase of emotional, physical, social, and spiritual health (Cramer et al., 2017; Grensman et al., 2018; Park, Riley, & Braun, 2016).

Yoga was a CHA that more women used to increase well-being and treat a chronic disease (Clark et al., 2018: Johnson, Jou, Rhee, Rockwood, and Upchurch, 2016). CHA users were predominantly non-Hispanic white women that had health insurance, and yoga was the most commonly used CHA (Johnson et al., 2016). About 85% of CHA

users said that the participation helped them to feel better and over 90% stated that CHA's were important for maintaining health and well-being (Johnson et al., 2016). Strowger, Kiken, and Ramcharran (2018) said that practicing mindful meditation promoted physical activity. Yoga increased the WHO-5 scores in middle-aged adults in cancer treatment (Haier et al., 2018). Cramer et al. (2017) stated that participants who occasionally practiced yoga were more likely to avoid behaviors associated with poor health such as smoking, alcohol use, and unhealthy diet. Cramer, Ward, Steel, Lauche, Dobos, and Zhang (2016) stated that about 31 million people in the United States had tried yoga and the most common reasons were for increased well-being and disease prevention.

**Women's Health and Yoga**

Yoga may be an answer to the decline in well-being in the United States. The popularity of modern yoga has risen over the past several years (Clark et al., 2018). Clark et al. (2018) stated that over 14% of adult participants in the 2017 NHIS used yoga in the past year. Cramer et al. (2017) said that women who practiced yoga were more physically active, ate healthier diets, were less likely to smoke, and consumed alcohol at low to moderate levels. Women were more likely to participate in yoga through community and social connections, for general health, and as a CHA for a chronic illness (Wertman et al., 2016). Women's reasons for participating in yoga included increased muscular strength, weight loss, and spiritual practice (Wertman et al., 2016). Yoga participants also enjoyed a sense of belonging through group practice, and women were more interested in the effects of the mind-body connection (Wertman et al., 2016).

**Physical health.** Blackwell and Clark (2018) stated that about 18% of women in the United States get the recommended amount of aerobic and muscle building physical activity. In some areas of the United States, less than 10% of women were physically active (Blackwell & Clark, 2018). Yang and James (2016) said that a yoga intervention was a pathway to increasing the physical activity levels of obese women and that face to face yoga classes increased the feelings of support. Over 70% of yoga participants were female, and the reasons for participation in yoga included general wellness, disease prevention, improved immune function, improved sports performance, and improved memory or concentration (Cramer et al., 2016).

Strowger et al. (2018) stated that people who used meditation were more likely to participate in aerobic activity. Larson-Meyer (2016) said that the majority of yoga asanas were a light aerobic activity, but combinations of poses such as the Surya Namaskar or, Sun Salutations, increased yoga to a moderate aerobic level. Practicing asana sequences for 10 minutes could contribute to meeting the recommended activity requirements (Strowger et al., 2018). The type of transition between asanas affected the amount of energy expended during yoga (Strowger et al., 2018). Jumping or isometric contractions between asanas increased the amount of energy expended, and standing poses expended more energy than sitting during yoga (Strowger et al., 2018).

The muscle activation during the Sun Salutation sequences varied by level of expertise and participants could derive increased strength and stability as they continue to practice yoga (Ni, Mooney, Balachandran, Richards, Harriell, & Signorile, 2014). Asanas such as Chair pose and Warrior II strengthen the tibialis anterior, a muscle-related to fall

prevention, ankle stability, and pain reduction in the ankle and foot (Ni et al., 2014). Ni et al. (2014) said that in the upward facing dog asana, participants activated the chest and abdominal muscles. Upward facing dog pose was therapeutic for those that spent extended hours working at a computer (Ni et al., 2014). The modification of the yoga asanas allowed for accessibility for all levels of muscular strength and endurance (Ni et al., 2014).

**Social cohesion.** Inequities in women's mortality rates were not only due to personal characteristics, but also contextual factors that exist throughout the United States. (Montez et al., 2016) Social cohesion was strongly associated with women's mortality rates and was at a similar level of influence as level of education (Montez et al., 2016). Park et al. (2016) said that yoga participants experienced a positive sense of community and a connection with others, more patience, increased mindfulness in daily interactions, more forgiveness for others, and better family relationships. Wertman et al. (2016) stated that those who started yoga at age 55 or older were more socially connected and were influenced by friends and family to practice yoga. Those that practiced yoga felt a connection to others in the class and viewed group yoga as a community experience (Wertman et al., 2016).

Discrimination based on size could impact social cohesion and could create a culture of exclusion in yoga classes (Pickett & Cunningham, 2017). Dimitrov Ulian et al. (2018) said that in the Health at Every Size intervention they focused on achieving a higher level of health instead of weight loss to encourage obese participants to adopt healthy behaviors. Health at Every Size promoted a healthier lifestyle that supported

well-being despite body weight, and the participants achieved modest weight loss (Dimitrov Ulian et al., 2018). Pickett and Cunningham (2017) stated that creating a culture of inclusion in a yoga class encouraged overweight or obese participants. The culture of inclusion fostered a sense of community and allowed participants to be their authentic self (Pickett & Cunningham, 2017). Body-Positive Yoga leaders' intentions and language choices were important in creating an inclusive environment and building a sense of community in the yoga classes (Pickett & Cunningham, 2017). Pickett and Cunningham (2017) stated that programs like Body-Positive Yoga created an environment of acceptance and increased group cohesion.

**Mental health and work-related burnout.** Grensman et al. (2018) stated that women were more likely to feel the effects of emotional and physical exhaustion described as burnout. Women who practiced yoga for burnout had higher levels of emotional well-being, physical well-being, cognitive function, and sleep (Grensman et al., 2018). Grensman et al. (2018) said that in a 20-week intervention with participants on sick-leave due to work-related burnout the traditional yoga group had increased emotional well-being, physical well-being, cognitive function, sleep, and general health.

Abdin, Welch, Byron-Daniel, and Meyrick, (2017) stated that yoga as a workplace physical activity intervention could also increase mental well-being and that participants felt less stress, less anxious and a greater purpose in life. Gaiswinkler and Unterrainer (2016) said that the experience and depth of yoga practice increased the level of mental well-being and that yoga may improve mental health more than other types of

physical activity. Since the decline of personal well-being impacts a large portion of the U.S. workforce, employers are searching for viable solutions (Kersemaekers et al., 2018).

Women dominate the teaching profession at about 80% of the educational workforce (Sutcher, Darling-Hammond, & Carver-Thomas, 2016). Hepburn and McMahon (2017) stated that teachers who participated in a five-week yoga pranayama breathing intervention gained increased work-life balance, reduced work-related stress, increased productivity at work, and created a culture of well-being among staff members. Gaiswinkler and Unterrainer (2016) stated that practicing mindfulness increased teachers' feelings of well-being and happiness. Telles et al. (2018) said that after completing a 15-day residential yoga training, teachers had less anxiety and an increased level of well-being as compared to a non-yoga control group. Telles et al. (2018) said that teaching was a socially responsible occupation and that educators needed a yoga intervention to maintain positive mental well-being. Harris et al. (2014) stated that participating in a 16-week yoga intervention increased teachers' ability to tolerate negative emotions, decreased work-related stress, and lowered morning cortisol levels. Bazzano, Anderson, Hylton, & Gustat (2018) stated that teachers who taught yoga in the classroom were able to maintain a higher level of equanimity during the workday. Therefore, promoting yoga as a women's population health intervention could improve the mental well-being of working women such as teachers (Bazzanao et al., 2018; Harris et al., 2014; Hepburn & McMahon, 2017 Telles et al., 2018).

**Fall prevention.** Having a lack of balance was a multi-dimensional issue that could impact an individual at any age or health status (Jeter, Moonaz, Bittner, &

Dagnelie, 2015). Subramaniam and Bhatt (2017) stated that during tasks that required both balance and cognitive function, yoga practitioners were able to maintain a higher level of balance control than non-practitioners. Yoga practitioners responded quicker to intentional balance control and had increased postural stability compared to non-practitioners (Subramaniam and Bhatt, 2017). Patti et al. (2018) said that body swaying was higher for elderly adults and that a lack of postural stability was related to the decline of cognitive functioning and muscle strength. Hamrick, Mross, Christopher, & Smith (2017) stated that participants had a significant reduction in falls after they completed the yoga intervention and that there were statistically significant differences in body swaying, balance, gait assessment, and dynamic gait index.

Jeter et al. (2015) said that participants in a yoga intervention who were legally blind significantly increased the absolute center of pressure, a measure of postural control. The blind yoga participants increased their ability to rebalance during walking (Jeter et al., 2015). The yoga practice emphasized foot placement during balance poses that increased the participant's proprioception (Jeter et al., 2017). Jeter et al. (2017) stated that the participant's stability index increased which indicated that the yoga practice improved the participant’s postural control.

The National Center for Injury Prevention and Control (2015) stated that when designing fall prevention interventions, public health scholars should identify a target audience, the level of interest in the activity, and determine the locations most convenient for participation. Smith et al. (2017) said that participants over the age of 59 were highly interested and attended over 80% of the yoga classes during the intervention. Hamrick et

al. (2017) stated that barriers to participation for older adults included the cost of the classes, the perception of the difficulty of yoga, a lack of information about yoga, and the location of classes. Cramer et al. (2016) stated that age was a predictor of yoga participation and that the older a person was, the less likely they were to participate. The benefits of yoga in fall prevention justified the consideration of yoga as a population health intervention (Cramer et al., 2016).

**Pain management.** The current protocol for the medical treatment of pain propelled the opioid epidemic and unintentional poisoning death rate to alarming rates (Tick et al., 2018). In a thirteen-week Hatha yoga intervention, participants had a significant reduction of pain compared to the control group (Monson, Chismark, Cooper, & Krenik-Matejcek, 2017). In a four-week Iyengar yoga intervention, participants achieved a significant reduction in low back pain and increased health-related quality of life compared to the control group (Nambi, Inbasekaran, Khuman, Devi, Shanmugananth, & Jagannathan, 2014). Goode et al. (2016) stated that chronic low back pain affected personal well-being and that individuals could benefit from a yoga practice. Allende, Anandan, Lauche, and Cramer (2018) said that the reduction of non-specific neck pain varied among participants and that teaching patients about the possibility of fluctuation in pain could help individuals during a yoga intervention. In an eight-week Hatha yoga intervention for chronic knee pain due to osteoarthritis, there were statistically significant differences in the Western Ontario and McMaster Universities Osteoarthritis Index scores between the yoga and control group (Cheung, Wyman, Resnick, & Savik, 2014). The CDC (2019b) recommended a plan of self-management and exercise for increasing

health-related quality of life for those suffering from osteoarthritis pain. Hatha yoga could be a part of the self-management and exercise plan to increase strength and flexibility in those with osteoarthritis (Zacharia, Taylor, Branscum, Cheney, Hofford, & Crowson, 2018). Goode et al. (2016) stated that there was a need for more research on the short and long-term effects of yoga for pain management.

**Chronic disease.** Chu, Gotink, Yeh, Goldie, and Hunink, (2016) stated that the risk factors for heart disease and MS were significantly reduced with a yoga intervention and were similar to the effects of aerobic exercise. Haider, Sharma, and Branscum, (2017) said that because patients could practice yoga at slow and low-intensity levels, those with the limitations due to heart disease could participate as compared to other higher intensity exercises. Posadzki, Cramer, Kuzdzal, Lee, and Ernst (2014) stated that participating in yoga could lower systolic blood pressure and diastolic blood pressure. Wolff, Brorsson, Midlöv, Sundquist, and Strandberg (2017) said that patients who participated in a yoga intervention for the reduction of hypertension enjoyed the benefits such as increased relaxation and improved flexibility. Yoga participants also experienced difficulties in integrating yoga into a daily routine (Wolff et al., 2017). Pullen, Seffens, and Thompson (2018) stated that future studies should focus on the energy expenditures for specific asanas and yoga styles before recommending a type of yoga for heart failure therapy. Yoga could be a way of managing hypertension and reducing the risks for heart disease, but public health scholars should complete more rigorous studies for confirmation (Chu et al., 2016; Haider et al., 2017; Posadzki et al., 2014; & Wolff et al., 2017).

Haier et al. (2018) stated that yoga could be an alternative way of improving the well-being of cancer patients. After completing ten 90-minute yoga sessions, 44 female and seven male participants with varying types of cancer scored higher on the WHO-5 questionnaire and scores were highly statistically significant for the study. Patients with lower WHO-5 scores pre-intervention had the most significant increase in post-intervention (Haier et al., 2018). The patients reflected concerns and fears of not understanding what types of physical activity were safe and appropriate during and after cancer treatment (Haier et al., 2018). Zuo, Li, Gao, Yang, and Meng (2016) stated that yoga was a valuable tool in helping breast cancer patients who experienced negative emotional well-being during treatment. Yoga improved patients' anxiety, depression, perceived stress, and emotional well-being (Zuo et al., 2016). Rao et al. (2017) said that the breast cancer patients who practiced yoga consistently after surgery and during radiation had significantly decreased depression, symptom severity, and increased quality of life. The yoga intervention reduced the participant's anxiety, and yoga served as a supportive therapy during breast cancer treatment (Rao et al., 2017). Vadiraja et al. (2017) stated that participating in yoga significantly reduced cancer patient fatigue frequency, severity, and diurnal fatigue variability compared to supportive therapy. More randomized controls could validate the findings that yoga is beneficial for cancer patients (Haier et al., 2018; Rao et al., 2017; & Vadiraja et al., 2017; Zuo et al., 2016).

Kaminsky et al. (2017) stated that yoga breathing for COPD was related to increased exercise tolerance and that practicing pranayama would work well in a self-management plan. Donesky, Selman, McDermott, Citron, and Howie-Esquivel (2017)

said that in a pilot study of an 8-week, tele-yoga program for COPD and heart failure patients, shortness of breath and distress improved significantly in the yoga group. Overall depression and sleep disturbance in the yoga group improved while both worsened for the control group (Donesky et al., 2017). Tele-yoga participants were able to participate safely in the classes and enjoyed the intervention (Donesky et al., 2017; Selman, McDermott, Donesky, Citron, and Howie-Esquivel, 2015). More research trials could examine different doses of yoga for COPD and heart failure patient rehabilitation (Donesky et al., 2017; Kaminsky et al., 2017; Selman et al., 2015).

## Summary

The major themes in the literature review indicate that yoga promotes well-being through increased feelings of cohesiveness and increased general health (Wertman et al., 2016). Yoga promotes physical, mental, and emotional well-being and is an effective CHA for chronic disease prevention and treatment (Wertman et al., 2016). Yoga is beneficial in pain management and increasing the quality of life for those suffering from chronic pain (Monson et al., 2017). Yoga, breathing and meditation practice reduces the anxiety that arises from the management of chronic diseases such as cancer (Haier et al., 2018; Rao et al., 2017; Vadiraja et al., 2017; Zuo et al., 2016). This study fills the gap in the literature on why public health could use yoga as a women's population health intervention to increase well-being and general health. The study also fills a gap in the research on examining yoga through the lens of public health. Chapter3 will present the research methods used in the study that includes the research design, rationale, and data analysis plan.

# Chapter 3: Research Method

## Introduction

The purpose of this study was to explore whether yoga, breathing and meditation, hypertension, high cholesterol, BMI, being told to increase physical activity, age, and teaching as an occupation were associated with SRH among women in the United States. Secondary data from the 2017 NHIS were used to examine whether these factors predicted higher SRH. The gap in the literature was the exploration of the value of yoga in population health promotion and examining yoga through the lens of public health.

Chapter 3 includes the explanation of the study's design using secondary data and the methodology used in this study. Chapter 3 also includes the description of the sample population, the subpopulation, and the origin of the data collection instrument. The threats to validity and ethical considerations are also included in this chapter.

## Research Design and Rationale

The HBM provided the theoretical framework for this cross-sectional study. The HBM suggests that when the perceived benefits of participating in a health behavior outweigh the barriers, behavior changes (Skinner et al., 2015). The HBM can be used to explain the increase in participation in yoga as women in the United States perceiving health benefits from practicing yoga. For instance, previous studies have demonstrated that participating in yoga, breathing exercises, and meditation is related to general well-being (Haier et al., 2018; Taneja, 2014; Wertman et al., 2016; Zuo et al., 2016). Studies on yoga interventions have also reported that practicing the components of yoga could reduce high blood pressure, lower BMI, improve cholesterol levels, and increase physical

activity (Chu et al., 2016; Leischner, 2015; Posadzki et al., 2014; Wolff et al., 2017). Further, teacher well-being was reported to increase after participating in yoga interventions (Bazzanao et al., 2018; Gaiswinkler & Unterrainer, 2016; Harris et al., 2014; Hepburn & McMahon, 2017; Telles et al., 2018). The age of the yoga participant might also be associated with well-being (Park, Braun, & Siegel, 2015).

## Methodology

### Sampling and Data Collection

The Department of Health and Human Services, NCHS, and the U.S. Census Bureau developed and implemented the NHIS to track the health of the U.S. population since the late 1950s (CDC, 2019a). The NHIS was intended to increase the data available to research trends in health behaviors and outcomes across the U.S. population (CDC, 2019a). The current supplement to the questionnaire includes complementary and alternative medicine questions, which has created one of the largest population-based complementary and alternative medicine datasets available (CDC, 2019a), making the NHIS survey data appropriate for this study.

NHIS trained interviewers surveyed 32,617 households over 1 year (CDC, 2019a). The NCHS used a cross-sectional design with samples drawn from each state and the District of Colombia and used an area probability design that sampled clusters of noninstitutionalized civilian households (CDC, 2019a). The NCHS protected the anonymity of the participants by the Privacy Act of 1974, the Public Health Service Act, and the Confidential Information Protection and Statistical Efficiency Act (CDC, 2019a).

The NCHS protects the privacy of the participants from the Freedom of Information Act and court subpoenas (CDC, 2019a).

**Population and Participation**

The population of this study included the 14,646 women participants of the NHIS 2017 survey who were between the ages of 18 to 85 and older (NCHS, 2018). The largest racial group represented were White at 78%, followed by African Americans at 11%, Asian at 6%, American Indian and Alaskan Natives at 1%, and multiple races at 3% (NCHS, 2018). The total number of households interviewed in the 2017 NHIS was 32,617 with 78,132 persons (NCHS, 2018). The household response rate was 67%, and the number of adult samples was 26,742, with a 53% unconditional response rate (NCHS, 2018). The participants did not receive compensation for participation.

**Instrumentation**

The NHIS consisted of a core questionnaire and supplemental questions on specific health topics (CDC, 2019a). Although the core questionnaire collected details on health conditions and demographics, the supplemental questions were related to current health issues such as health behaviors, complementary and alternative medicines, and access to health care (CDC, 2019a). The 2017 NHIS included a complementary health supplement that added the following questions: practicing yoga, past 12 months, did breathing exercises as a part of yoga, and did meditation as a part of yoga into the sample adult questionnaire collected from one adult in each household (NCHS, 2018). Updates to the NHIS occurred every 10 to 15 years to maintain the collection of pertinent data (CDC, 2019a). This study used the sample adult file set Final Annual (WTFA_SA),

which include poststratification adjustment (age-sex-race adjustments to census population control totals; NCHS, 2018).

### Operationalization

The dependent variable for SRH or perceived benefit variable had three levels, and the question was labeled AHSTATYR: health better, worse, or same compared with 12 months ago. The dependent variable used to determine female participants was labeled Sex, and the age range variable was labeled Age. The factor practiced yoga, past 12 months was labeled YTQU_YG1, did breathing exercises as part of yoga was labeled YTQ_BTY1, and did meditation as part of yoga was labeled YTQ_MDy1. Teacher occupation was recoded from the detailed occupation classification labeled OCCP1. The factor had hypertension, past 12 months was labeled HYPR1; had high cholesterol, past 12 months was labeled CHLYR; told to increase physical activity, past 12 months was labeled DBHVPAY; and body mass index was labeled BMI. The covariate in the analysis was age and was labeled AGE.

## Data Analysis Plan

I used a correlation, cross-sectional design to analyze secondary data. I used an ordinal logistic regression in SPSS to test for associations using data collected from the 2017 NHIS. I explored how well the factors of recommendations for increasing physical activity, having hypertension, having high cholesterol, practicing the components of yoga, teacher occupation, BMI category and age predicted the dependent variable SRH. I used a cumulative odds ordinal logistical regression with proportional odds to determine the effect of the factors and covariate on the level of SRH. I used SPSS version 25

software program using ordinal logistical regression. Odds ratios and 95% confidence intervals were calculated with α set a $P < .05$. The tests for each research question are shown in Table 1. Each variable was tested independently in a binary logistic regression on the dichotomized cumulative dependent variable categories since the sample was large (Laerd Statistics, 2015). The outcome of the analysis also explored whether any of the factors or covariate had a statistically significant effect on SRH. The study addressed the gap in public health research on the use of yoga by women as health-promoting behavior and how yoga impacted their overall health and well-being.

Table 1

*Research Questions with Null Hypothesis and Statistical Analysis*

| Research question | Null hypothesis | Statistical procedure |
|---|---|---|
| RQ1. Are the factors practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, teacher occupational status, and age factors that predict SRH? | There is no association between practicing yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, teacher occupational status, age, and SRH. | Ordinal logistic regression |
| RQ2. Are the factors told to increase physical activity past 12 months, BMI, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga factors that predict SRH? | There is no association told to increase physical activity past 12 months, BMI, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and SRH. | Ordinal logistic regression |
| RQ3. Are the factors had hypertension, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga factors that predict SRH? | There is no association between had hypertension, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and SRH. | Ordinal logistic regression |
| RQ4. Are the factors had high cholesterol, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga factors that predict SRH? | There is no association between had high cholesterol, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and SRH. | Ordinal logistic regression |

**Variables and Variable Recoding**

The statistical analyses were filtered for female responses, Sex = 2. The variable descriptions are reported in detail in Table 1. The dependent variable in this study was health better/worse/same, compared with 12 months ago (AHSTATYR), which was recoded SRH. Respondents could answer *better, worse*, *about the same*, or *don't know*. The data were transformed into categories of *better*, *worse*, or *about the same* with *don't know, refused to answer*, and *not ascertained* categorized as system *missing*. Responses of *don't know*, *refused to answer*, and *not ascertained* totaled 26, which was less than .01% of the sample.

The factor practiced yoga, past 12 months (YTQU_YG1), was recoded Yoga. Respondents could answer *yes, no*, or *don't know* if they had practiced yoga in the past 12 months. The data were transformed into a dichotomous variable (*yes* or *no*), whereas *don't know, refused to answer*, and *not ascertained* were categorized as *no*. There were 847 responses recoded as *no*, representing .03% of the sample. If the respondents answered *yes* to practiced yoga past 12 months, they were directed to the questions about breathing and meditation. The factor did breathing exercises as a part of yoga (YTQ_BTY1) was recoded Breathing. Respondents could answer *yes, no*, or *don't know* if they did breathing exercises as a part of yoga. The data were transformed into a dichotomous variable (*yes* or *no*), whereas *don't know, refused to answer*, and *not ascertained* were categorized as *no*. There were four responses recoded as *no*, representing less than .001% of the sample. The factor did meditation as a part of yoga (YTQ_MDY1) was recoded Meditation. Respondents could answer *yes, no*, or *don't*

*know* if they did meditation as a part of yoga. The data were transformed into a dichotomous variable (*yes* or *no*), whereas *don't know*, *refused to answer*, and *not ascertained* were categorized as *no*. There were five responses recoded as *no*, representing less than .001% of the sample.

The factor teacher occupation (OCCP1) was recoded JobTeacher. The detailed occupation classification was based on the 2010 census codes that included three categories for teacher occupation. OCCP1 was recoded as 0 for occupations other than teaching, 1 for the postsecondary teacher; 2 for other education, training, and library; and 3 for primary, secondary, and special education (K-12).

The factor told to increase physical activity, past 12 months (DBHVPAY) was recoded IncreaseActivity. Respondents could answer *yes*, *no*, or *don't know* if they had been told to increase physical activity in the past 12 months. The data were transformed into a dichotomous variable (*yes* or *no*), whereas *don't know*, *refused to answer*, and *not ascertained* were categorized as *no*. There were 35 responses recoded as *no*, representing .001% of the sample.

The factor had hypertension, past 12 months (HYPYR1) was recoded HadHypyr. Respondents could answer *yes*, *no*, or *don't know* if they had hypertension in the past 12 months. The data were transformed into a dichotomous variable (*yes* or *no*), whereas *don't know*, *refused to answer*, and *not ascertained* were categorized as *no*. There were 29 responses recoded as *no*, representing .001% of the sample.

The factor had high cholesterol (CHLYR) was recoded HadHighChlyr. Respondents could answer *yes*, *no*, or *don't know* if they had high cholesterol in the past

12 months. The data were transformed into a dichotomous variable (*yes* or *no*), whereas *don't know*, *refused to answer*, and *not ascertained* were categorized as *no*. There were 197 responses recoded as *no*, representing .007% of the sample.

The factor BMI variable in NHIS was formulated with the answers to the questions of total height in inches and weight without shoes in pounds. The BMI variable was calculated using the formula weight/height squared. BMI was recoded as a categorical variable using underweight for BMI < 18.5, obese for BMI ≥30, overweight for BMI ≥25 to < 30, and healthy weight for BMI 18.5 < 25 (CDC, 2017b). There were 220 values for BMI coded as system missing, representing .02% of the sample. The covariate Age was recorded in the adult sample as 1-84 years or 85+ years. No recodes were necessary for age.

Table 2

*Variable Descriptions from 2017 National Health Interview Survey*

| Outcome (Dependent) Variable | | | | | |
|---|---|---|---|---|---|
| Variable | File Location, Question # | Data Scale | Response Option | Question | Code |
| SRH | Sample Adult AHS.060.00.000 | Nominal | Better, Worse, About the same, Refused, Don't know | Compared with 12 MONTHS AGO, would you say your health is better, worse, or about the same? | AHSTATYR |
| Yoga | Sample Adult ACH.110_00.000 | Nominal | Yes, No, Refused, Don't know | DURING THE PAST 12 MONTHS, did you practice Yoga for yourself? | YTQU_YG1 |
| Breathing | Sample Adult ACH.120_00.000 | Nominal | Yes, No, Refused, Don't know | Did you do breathing exercises as part of Yoga? Breathing exercises may involve actively controlling the way air is drawn in, or the rate or depth of breathing. | YTQ_BTY1 |
| Meditation | Sample Adult ACH.130_00.000 | Nominal | Yes, No, Refused, Don't know | Did you do meditation as a part of Yoga? | YTQ_MDY1 |
| JobTeacher | Sample Adult ASD.090_00.000 | Nominal | Verbatim response | Have you ever worked? If yes, what kind of business or industry was this? What kind of work were you doing? | OCCP1 |
| HadHypertension | Sample Adult ACN.020_00.010 | Nominal | Yes, No, Refused, Don't know | DURING THE PAST 12 MONTHS, have you had hypertension, also called high blood pressure? | HYPYR1 |
| HadHighChlyr | Sample Adult ACN.023_00.020 | Nominal | Yes, No, Refused, Don't know | DURING THE PAST 12 MONTHS, have you had high cholesterol? | CHLYR |
| IncreaseActivity | Sample Adult ACN.155_00.020 | Nominal | Yes, No, Refused, Don't know | DURING THE PAST 12 MONTHS, have you been told by a doctor or health professional to do any of the following…Increase your physical activity or exercise | DBHVPAY |
| BMI | Sample Adult AHB.200_02.000 | Continuous | 2 - 7 feet, 0 - 11 inches, 50 - 500 pounds, Refused, Don't know | Calculated from the questions: How tall are you without shoes? How much do you weigh without shoes | BMI |
| Age | Sample Adult, HHC.420_00.000 | Continuous | Years, Refused, Don't know | How old are you? | AGE |

*Note.* ACH = adult complementary health

**Research Questions and Hypotheses**

Research Question 1: Are the factors practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, teacher occupational status, and the covariate age factors that predict self-rated health?

$H_1$1: There is an association between practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, teacher occupational status, age, and self-rated health.

$H_0$1: There is no association between practicing yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, teacher occupational status, age, and self-rated health.

Research Question 2: Are the factors told to increase physical activity past 12 months, BMI, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga factors that predict self-rated health?

$H_1$2: There is an association between told to increase physical activity past 12 months, BMI, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

$H_0$2: There is no association told to increase physical activity past 12 months, BMI, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

Research Question 3: Are the factors had hypertension, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga factors that predict self-rated health?

$H_1$3: There is an association between had hypertension, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

$H_0$3: There is no association between had hypertension, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

Research Question 4: Are the factors had high cholesterol, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga factors that predict self-rated health?

$H_1$4: There is an association between had had high cholesterol, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

$H_0$4: There is no association between had high cholesterol, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

**Verification of assumptions for statistical tests.** Multicollinearity between independent variables was assessed through linear regression by the coefficient tolerance values. Proportional odds was assessed through binary logistic regression with a full likelihood ratio test comparing the fit of the proportional odds model to a model with varying location parameters. Both assumptions that are listed above are discussed further in chapter 4.

**Sample size estimate/power analysis.** A power analysis was performed with G*Power 3.1.9.2 for Windows (Faul, Erdfelder, Buchner, Lang, & Universität Düsseldorf, Germany, 2009). Using an a priori method selecting a medium-size effect for Pr(Y=1) H0= .2, with an alpha set at 0.05 (two-tailed) and an odds ratio set at 1.3. The power was calculated to be .95. The minimum sample size was calculated at 1188, which was below the total number of female respondents in the 2017 NHIS adult sample.

## Threats to Validity

Threats to the internal validity of this study included the change in the Adult Complementary Health Supplement questions in the 2017 NHIS. The 2017 NHIS questions asked about the use of CHA in the past 12 months without inquiry about lifetime use (NCHS, 2018). Other threats to the internal validity included the self-reporting bias of the NHIS questionnaire. Threats to the external validity were minimized through the clustered samples within the counties, small groups of counties, or metropolitan area addresses (CDC. 2019a). The interpretation of practicing yoga, breathing, and meditation could also impact the external validity of the NHIS data.

## Ethical Procedures

The NCHS provided basic interviewer training relevant to the NHIS to the U.S. Census Bureau workers that collected the NHIS data (CDC, 2019a). Interviewers used computer-assisted personal interviewing software using a laptop to enter participant responses (CDC, 2019). The participants identities and personal information were protected and removed from all public use files (NCHS, 2018). The NHIS data release procedures protect the privacy of the participants (NCHS, 2018).

## Summary

This study used secondary data from the 2017 NHIS. NHIS is a national survey implemented yearly to track the U.S. health status, health behaviors, and information on contemporary health issues. This study addressed the gap in the literature through the exploration of how participating in yoga, breathing as a part of yoga, meditation as a part of yoga, health status, recommendations for increasing physical activity, BMI, age and teacher occupation; predict the level of better SRH. The NHIS collected data from cluster samples across the U.S. and the District of Columbia. The results of the ordinal logistical regression, proportional odds, frequencies, and statistical significance of the variables will be in Chapter 4.

# Chapter 4: Results

## Introduction

In this quantitative, cross-sectional study, I explored the association of practicing yoga, breathing, meditation, teacher occupation, age, being told to increase activity, BMI, hypertension, and high cholesterol with women's SRH. The perceived benefits of yoga, breathing exercises as a part of yoga, and meditation as a part of yoga as well as the perceived consequences of health outcomes were examined. Teaching as an occupation and age were also considered in determining the prediction of the answer to the question, "Compared with 12 months ago, would you say your health is better, worse, or about the same?" I used the data from the 2017 NHIS adult sample and included several statistical tests for assumptions of an ordinal logistic regression. The results of the analysis attempted to predict the probability of the dependent variable, SRH. The factors were practiced yoga, past 12 months; practiced breathing as a part of yoga; practiced meditation as a part of yoga; teacher occupation; told to increase physical activity; had hypertension, past 12 months; had high cholesterol, past 12 months; and BMI. The covariate was age.

Four research questions were asked to address the purpose of the study:

Research Question 1: Are the factors practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, teacher occupational status, and the covariate age factors that predict self-rated health?

$H_1$1: There is an association between practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, teacher occupational status, age, and self-rated health.

$H_0$1: There is no association between practicing yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, teacher occupational status, age, and self-rated health.

Research Question 2: Are the factors told to increase physical activity past 12 months, BMI, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga factors that predict self-rated health?

$H_1$2: There is an association between told to increase physical activity past 12 months, BMI, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

$H_0$2: There is no association told to increase physical activity past 12 months, BMI, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

Research Question 3: Are the factors had hypertension, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga factors that predict self-rated health?

$H_1$3: There is an association between had hypertension, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

$H_0$3: There is no association between had hypertension, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

Research Question 4: Are the factors had high cholesterol, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga factors that predict self-rated health?

$H_1$4: There is an association between had had high cholesterol, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

$H_0$4: There is no association between had high cholesterol, past 12 months, practiced yoga past 12 months, did breathing exercises as a part of yoga, practiced meditation as a part of yoga, and self-rated health.

Chapter 4 provides the descriptive statistics of the sample from the 2017 NHIS data used in the study and the results of the statistical tests in compliance with the assumptions that were necessary for the ordinal logistic regression. The chapter concludes with the presentation of the results of the data analysis, and the hypothesis testing and findings are organized by the research questions. Exact statistics, probability values, and effect sizes are detailed as appropriate. The chapter ends with a summary and transition to Chapter 5.

## Descriptive Statistics

The dataset consisted of the Sample Adult file from the 2017 NHIS and included 14,646 female cases over the age of 18. All the female cases were included in the

analysis. Of those cases, 18% of women practiced yoga in the past 12 months. Of the 2,614 women who practiced yoga, 89% did breathing exercises as a part of yoga, and 57% did meditation as a part of yoga. Out of all the female cases, 36% had been told to increase physical activity. From the 4,461 female cases that included data on having hypertension in the past 12 months, 86% answered *yes*. Of the 4,505 female cases that included data on having high cholesterol in the past 12 months, 70% answered *yes*. The mean age of respondents was 52. There were 1,096 women categorized as teachers; 822 were K-12 teachers; 143 were other education, training, and library; and 131 were postsecondary teachers. Of the 14,426 female samples, 2% were underweight, 25% were obese, 27% were overweight, and 36% were at a healthy weight. An overview of the dependent variable, factors, and covariates are presented in Table 3.

Table 3

*Demographics of Study Sample (n = 14,464) and Variable Frequencies*

| | Frequency | Percent |
|---|---|---|
| Sex = female | 14,646 | 100 |
| Yoga | | |
| Yes | 2,614 | 17.8 |
| No | 11,545 | 78.8 |
| Breathing | | |
| Yes | 2,332 | 89.2 |
| No | 278 | 10.6 |
| Meditation | | |
| Yes | 1,476 | 56.5 |
| No | 1,134 | 43.4 |
| IncreaseActivity | | |
| Yes | 5,267 | 36 |
| No | 9,360 | 63.9 |
| HadHypertension | | |
| Yes | 3,857 | 86.5 |
| No | 594 | 13.3 |
| HadHighCholesterol | | |
| Yes | 3,172 | 70.4 |
| No | 1,232 | 27.4 |
| JobTeacher | | |
| Yes | 1,096 | 7.5 |
| No | 13,550 | 92.5 |
| BMI | | |
| Underweight | 331 | 2.3 |
| Obese | 5,044 | 34.4 |
| Overweight | 3,827 | 26.1 |
| Healthy | 5,224 | 35.7 |
| Age | | |
| Range = 67 | | |
| Min. = 18 | | |
| Max. = 85+ | | |
| *SD* = 18.2 | | |

## Assessment for Statistical Assumptions

The statistical test used to determine the statistical assumption of multicollinearity was linear regression (Laerd Statistics, 2015). The test used for determining proportional odds was a full likelihood ratio test comparing the fit of the proportional odds model with varying location parameters (Laerd Statistics, 2015). Each test was completed, and variables were assessed for meeting the assumptions of the ordinal logistic regression. Table 4 displays the results of the linear regression for the factors and covariate in the study. The tolerance value for each factor was greater than .01, and the VIF values are much less than 10; therefore, there was no problem with collinearity in the dataset. Table 5 displays the results of the separate binomial logistic regressions for the factors and covariate in the study. The assumption of proportional odds was tenable since the parameter estimates were similar for all the factors and the covariate.

Table 4

*Multicollinearity*

| Coefficients | | | |
|---|---|---|---|
| Model | | Collinearity Statistics | |
| | | Tolerance | VIF |
| 1 | Yoga | .989 | 1.012 |
| | Breathing | .504 | 1.984 |
| | Meditation | .506 | .977 |
| | Had high cholesterol | .926 | 1.080 |
| | Increase activity | .942 | 1.062 |
| | Had hypertension | .923 | 1.083 |
| | Job teacher | .995 | 1.005 |
| | BMI | .910 | 1.099 |
| | Age | .937 | 1.067 |

Table 5

*Proportional Odds*

| | B (parameter estimates) | | Exp (B) | |
|---|---|---|---|---|
| Factor | SRH worse or same | SRH Better | SRH worse or same | SRH better |
| Yoga | .220 | -.220 | 1.246 | .802 |
| Breathing | -.332 | -.332 | .717 | .717 |
| Meditation | -.433 | -.433 | .649 | .649 |
| Had high cholesterol | .117 | -.117 | 1.124 | .889 |
| Increase activity | -.247 | .247 | .781 | 1.280 |
| Had hypertension | .225 | -.225 | 1.253 | .798 |
| Job teacher | | | | |
| Post Secondary | -.173 | .173 | .841 | 1.189 |
| Other Teacher | -.139 | .139 | .870 | 1.149 |
| K-12 | -.063 | .063 | .939 | 1.066 |
| BMI | | | | |
| Underweight | -.47 | .47 | .954 | 1.048 |
| Obese | .157 | -.157 | 1.170 | .855 |
| Overweight | .134 | -.134 | 1.143 | .875 |
| Healthy | .051 | -.051 | 1.052 | .951 |
| Age | .012 | .012 | 1.012 | .988 |

## Results

### Research Question 1 Ordinal Logistic Regression

A cumulative odds ordinal logistic regression with proportional odds was run to investigate whether teacher occupation, age, and practiced yoga in the past 12 months were factors that predict SRH. The deviance goodness-of-fit test indicated that the model was a good fit to the observed data $X^2$ (827) = 868.866, $p$ = .152. The final model statistically significantly predicted the dependent variable over and above the intercept-only model, $X^2$ (5) = 292.317, $p$ <.001. The odds of practiced yoga in the past 12 months having higher SRH was .724, 95% CI [.660, .794] times that for did not practice yoga in the past 12 months $x^2$(1) = 46.532, $p$ = .000. The teacher occupation had a statistically significant effect on the prediction of SRH $x^2$(3) = 10.265, $p$ = .016. The odds of a

teacher occupation having higher SRH was .797, 95% CI [.684,.928] times that for other occupations $x^2(1) = 8.546$, $p = .003$. An increase in age (expressed in years) was associated with an increase in the odds of having SRH better than 12 months ago, with an odds ratio of .986, 95% CI [.985,.988], $x^2(1) = 188.428$, $p < .001$.

Table 6

*Research Question 1 Practiced Yoga*

| Parameter Estimates | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 95% Wald Confidence Interval | | Hypothesis Test | | | | 95% Wald Confidence Interval for Exp(B) | |
| Parameter | B | Std. Error | Lower | Upper | Wald Chi-Square | df | Sig. | Exp(B) | Lower | Upper |
| Practiced Yoga No | -.323 | .0474 | -.416 | -.230 | 46.532 | 1 | .000 | .724 | .660 | .794 |
| Practiced Yoga Yes | 0[a] | . | . | . | . | . | . | 1 | . | . |
| Other Occupations | -.227 | .0778 | -.380 | -.075 | 8.546 | 1 | .003 | .797 | .684 | .928 |
| Post-Secondary Teacher | -.036 | .2017 | -.431 | .359 | .032 | 1 | .858 | .965 | .650 | 1.432 |
| Other Teacher | -.047 | .1952 | -.429 | .336 | .057 | 1 | .811 | .954 | .651 | 1.399 |
| K-12 Teacher | 0[a] | . | . | . | . | . | . | 1 | . | . |
| Age | -.014 | .0010 | -.016 | -.012 | 188.428 | 1 | .000 | .986 | .985 | .988 |

A cumulative odds ordinal logistic regression with proportional odds was also run to investigate whether teacher occupation, age, did breathing exercises as a part of yoga, and did meditation as a part of yoga were factors that predict SRH. The deviance goodness-of-fit test indicated that the model was a good fit to the observed data $X^2$ (1108) = 868.866, $p = .165$. The final model statistically significantly predicted the dependent variable over and above the intercept-only model, $X^2$ (6) = 294.993, $p < .001$.

The odds of did breathing as a part of yoga having higher SRH was .844, 95% CI [.731, .974] times that for did not do breathing as a part of yoga $x^2(1) = 5.382$, $p = .020$. The odds of did meditation as a part of yoga having higher SRH was .784, 95% CI [.660, .930] times that for did not do meditation as a part of yoga $x^2(1) = 7.799$, $p = .005$. The teacher occupation had a statistically significant effect on the prediction of SRH $x^2(3) = 10.265$, $p = .016$. The odds of teacher occupation having higher SRH was .796, 95% CI [.683,.927] times that for other occupations $x^2(1) = 8.546$, $p = .003$. An increase in age (expressed in years) was associated with an increase in the odds of having SRH better than 12 months ago, with an odds ratio of .986, 95% CI [.984,.988], $x^2(1) = 190.711$, $p < .001$.

Table 7

*Research Question 1 Breathing and Meditation*

| Parameter Estimates | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 95% Wald Confidence Interval | | Hypothesis Test | | | | 95% Wald Confidence Interval for Exp(B) | |
| Parameter | B | Std. Error | Lower | Upper | Wald Chi-Square | df | Sig. | Exp(B) | Lower | Upper |
| Other professions | -.228 | .0778 | -.381 | -.076 | 8.600 | 1 | .003 | .796 | .683 | .927 |
| Post-Secondary Teacher | -.036 | .2017 | -.431 | .359 | .032 | 1 | .858 | .965 | .650 | 1.432 |
| Other Teacher | -049 | .1952 | -.432 | .334 | .063 | 1 | .802 | .952 | .649 | 1.396 |
| K-12 Teacher | 0[a] | . | . | . | . | . | . | 1 | . | . |
| Age | .014 | .0010 | -.016 | -.012 | 190.711 | 1 | .000 | .986 | .984 | .988 |
| Did breathing No | 170 | .0731 | -.313 | -.026 | 5.382 | 1 | .020 | .844 | .731 | .974 |
| Did breathing Yes | 0[a] | . | . | . | . | . | . | 1 | . | . |
| Did Meditation No | .244 | .0873 | -.415 | -.073 | 7.799 | 1 | .005 | .784 | .660 | .930 |
| Did Meditation Yes | 0[a] | . | . | . | . | . | . | 1 | . | . |

**Research Question 2 Ordinal Logistic Regression**

A cumulative odds ordinal logistic regression with proportional odds was run to investigate whether told to increase activity, BMI category and practiced yoga in the past 12 months, were factors that predict SRH was conducted. The final model statistically significantly predicted the dependent variable over and above the intercept-only model, $X^2$ (4) = 114.892, $p$ <.001. The odds of practiced yoga in the past 12 months having higher SRH was .635, 95% CI [.579, .697] times that for did not practice yoga in the past 12 months $x^2(1) = 91.395$, $p = .000$. The odds of not being told to increase activity having higher SRH was 1.079, 95% CI [.998, 1.167] times than for being told to increase activity $x^2(1) = 3.608$, $p = .05$. BMI had a statistically significant effect on the prediction of SRH $x^2(3) = 18.780$, $p = .000$. The odds of a healthy weight BMI having higher SRH was .735, 95% CI [.575, .939] times that for being underweight $x^2(1) = 6.052$, $p = .014$. The odds of a healthy BMI having higher SRH was .911, 95% CI [.832, .997] times that for being obese $x^2(1) = 4.089$, $p = .043$.

Table 8

*Research Question 2 Practiced Yoga*

| Parameter Estimates | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 95% Wald Confidence Interval | | Hypothesis Test | | | | 95% Wald Confidence Interval for Exp(B) | |
| Parameter | B | Std. Error | Lower | Upper | Wald Chi-Square | df | Sig. | Exp(B) | Lower | Upper |
| Increase Activity NO | .076 | .0400 | -.002 | .154 | 3.608 | 1 | .058 | 1.079 | .998 | 1.167 |
| Increase Activity Yes | 0[a] | . | . | . | . | . | . | 1 | . | . |
| Practiced Yoga No | -.454 | .0475 | -.547 | -.361 | 91.395 | 1 | .000 | .635 | .579 | .697 |
| Practiced Yoga Yes | 0[a] | . | . | . | . | . | . | 1 | . | . |
| BMI Underweight | -.308 | .1251 | -.553 | -.063 | 6.052 | 1 | .014 | .735 | .575 | .939 |
| BMI Obese | -.093 | .0461 | -.183 | -.003 | 4.089 | 1 | .043 | .911 | .832 | .997 |
| BMI Overweight | .076 | .0470 | -.016 | .169 | 2.646 | 1 | .104 | 1.079 | .984 | 1.184 |
| BMI Healthy Weight | 0[a] | . | . | . | . | . | . | 1 | . | . |

A cumulative odds ordinal logistic regression with proportional odds was run to investigate whether being told to increase activity, BMI category, did breathing exercises as a part of yoga, and did meditation as a part of yoga were factors that predict SRH was conducted. The final model statistically significantly predicted the dependent variable over and above the intercept-only model, $X^2$ (6) = 486.594, $p$ <.001. The odds of did breathing as a part of yoga having higher SRH was .752, 95% CI [.651, .869] times that for did not do breathing as a part of yoga $x^2(1) = 14.957$, $p = .000$. The odds of did meditation as a part of yoga having higher SRH was .766, 95% CI [.644, .910] times that for did not do meditation as a part of yoga $x^2(1) = 9.206$, $p = .002$. The odds of not being told to increase activity having higher SRH was 1.077, 95% CI [.996, 1.165] times than for being told to increase activity $x^2(1) = 3.450$, $p = .063$. BMI had a statistically significant effect on the prediction of SRH $x^2(3) = 19.036$, $p = .000$. The odds of a

healthy BMI having higher SRH was .729, 95% CI [.571, .932] times that for being underweight $x^2(1) = 6.378$, $p = .012$. The odds of a healthy weight BMI having higher SRH was .905, 95% CI [.827, .991] times that for being obese $x^2(1) = 4.676$, $p = .031$.

Table 9

*Research Question 2 Breathing and Meditation*

| | Parameter Estimates | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | 95% Confidence Interval | |
| | Estimate | Std. Error | Wald | df | Sig. | Lower Bound | Upper Bound |
| Increase Activity Yes | .074 | .040 | 3.450 | 1 | .063 | -.004 | .153 |
| Increase Activity No | 0[a] | . | . | 0 | . | . | . |
| BMI Underweight | -.316 | .125 | 6.378 | 1 | .012 | -.561 | -.071 |
| BMI Obese | -.099 | .046 | 4.676 | 1 | .031 | -.190 | -.009 |
| BMI Overweight | .070 | .047 | 2.209 | 1 | .137 | -.022 | .162 |
| BMI Healthy weight | 0[a] | . | . | 0 | . | . | . |
| Did Breathing No | -.285 | .074 | 14.957 | 1 | .000 | -.430 | -.141 |
| Did Breathing Yes | 0[a] | . | . | 0 | . | . | . |
| Did Meditation No | -.267 | .088 | 9.206 | 1 | .002 | -.440 | -.095 |
| Did Meditation Yes | 0[a] | . | . | 0 | . | . | . |

**Research Question 3 Ordinal Logistic Regression**

A cumulative odds ordinal logistic regression with proportional odds was run to investigate whether had hypertension in the past 12 months and practiced yoga in the past 12 months, were factors that predict SRH was conducted. There were proportional odds, as assessed by a full likelihood ratio test comparing the fitted model to a model with varying location parameters, $X^2$ (2) = 4.173, $p = .124$. The deviance goodness-of-fit test indicated that the model was a good fit to the observed data $X^2$ (4) = 4.286, $p = .369$. The final model statistically significantly predicted the dependent variable over and above the

intercept-only model, $X^2$ (2) = 31.380, $p$ <.001. The odds of practiced yoga in the past 12 months having higher SRH was .689, 95% CI [.554, .855] times that for not practiced yoga in the past 12 months $x^2$(1) = 11.372, $p$ = .001. The odds of not had hypertension in the past 12 months having higher SRH was .676, 95% CI [.565, .809] times that for had hypertension in the past 12 months $x^2$(1) = 18.238, $p$ = .000.

Table 10

*Research Question 3 Practiced Yoga*

| Parameter Estimates | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 95% Wald Confidence Interval | | Hypothesis Test | | | | 95% Wald Confidence Interval for Exp(B) | |
| Parameter | B | Std. Error | Lower | Upper | Wald Chi-Square | df | Sig. | Exp(B) | Lower | Upper |
| Had Hypertension Yes | -.391 | .0916 | -.571 | -.212 | 18.238 | 1 | .000 | .676 | .565 | .809 |
| Had Hypertension No | 0[a] | . | . | . | . | . | . | 1 | . | . |
| Practiced Yoga No | -.373 | .1107 | -.590 | -.156 | 11.372 | 1 | .001 | .689 | .554 | .855 |
| Practiced Yoga Yes | 0[a] | . | . | . | . | . | . | 1 | . | . |

A cumulative odds ordinal logistic regression with proportional odds was run to investigate whether had hypertension in the past 12 months, did breathing exercises as a part of yoga, and did meditation as a part of yoga were factors that predict SRH was conducted. There were proportional odds, as assessed by a full likelihood ratio test comparing the fitted model to a model with varying location parameters, $X^2$ (3) = 6.844, $p$ = .077. The deviance goodness-of-fit test indicated that the model was a good fit to the observed data $X^2$ (11) = 14.158, $p$ = .224. The final model statistically significantly predicted the dependent variable over and above the intercept-only model, $X^2$ (3) =

28.443, $p$ <.001. The odds of did breathing as a part of yoga having higher SRH was .882, 95% CI [.625, 1.244] times that for did not do breathing as a part of yoga $x^2(1)$ = .512, $p$ = .474. The odds of did meditation as a part of yoga having higher SRH was .740, 95% CI [.479, 1.142] times that for did not do meditation as a part of yoga $x^2(1)$ = 1.850, $p$ = .174. The odds of not had hypertension in the past 12 months having higher SRH was .675, 95% CI [.564, .808] times that for had hypertension in the past 12 months $x^2(1)$ = 18.371, $p$ = .000.

Table 11

*Research Question 3 Breathing and Meditation*

| Parameter Estimates | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 95% Wald Confidence Interval | | Hypothesis Test | | | | 95% Wald Confidence Interval for Exp(B) | |
| Parameter | B | Std. Error | Lower | Upper | Wald Chi-Square | df | Sig. | Exp(B) | Lower | Upper |
| Had Hypertension Yes | -.393 | .0916 | -.572 | -.213 | 18.371 | 1 | .000 | .675 | .564 | .808 |
| Had Hypertension No | 0[a] | . | . | . | . | . | . | 1 | . | . |
| Did Breathing Exercises No | -.126 | .1756 | -.470 | .219 | .512 | 1 | .474 | .882 | .625 | 1.244 |
| Did Breathing Exercises Yes | 0[a] | . | . | . | . | . | . | 1 | . | . |
| Did Meditation No | -.301 | .2216 | -.736 | .133 | 1.850 | 1 | .174 | .740 | .479 | 1.142 |
| Did Meditation Yes | 0[a] | . | . | . | . | . | . | 1 | . | . |

**Research Question 4 Ordinal Logistic Regression**

A cumulative odds ordinal logistic regression with proportional odds was run to investigate whether had high cholesterol in the past 12 months and practiced yoga in the past 12 months, were factors that predict SRH was conducted. The final model statistically significantly predicted the dependent variable over and above the intercept-

only model, $X^2$ (2) = 60.853, $p$ <.001. The odds of practiced yoga in the past 12 months having higher SRH was .582, 95% CI [.484, .701] times that for not practiced yoga in the past 12 months $x^2(1) = 32.569$, $p$ = .000. The odds of not had high cholesterol in the past 12 months having higher SRH was .814, 95% CI [.708, .936] times that for had high cholesterol in the past 12 months $x^2(1) = 8.316$, $p$ = .004.

Table 12

*Research Question 4 Practiced Yoga*

| Parameter Estimates | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 95% Wald Confidence Interval | | Hypothesis Test | | | | 95% Wald Confidence Interval for Exp(B) | |
| Parameter | B | Std. Error | Lower | Upper | Wald Chi-Square | df | Sig. | Exp(B) | Lower | Upper |
| Practiced Yoga No | -.541 | .0947 | -.726 | -.355 | 32.569 | 1 | .000 | .582 | .484 | .701 |
| Practiced Yoga Yes | 0[a] | . | . | . | . | . | . | 1 | . | . |
| Had High Cholesterol Yes | -.206 | .0714 | -.346 | -.066 | 8.316 | 1 | .004 | .814 | .708 | .936 |
| Had High Cholesterol No | 0[a] | . | . | . | . | . | . | 1 | . | . |

A cumulative odds ordinal logistic regression with proportional odds was run to investigate whether had high cholesterol in the past 12 months, practiced breathing exercises as a part of yoga, and practiced meditation as a part of yoga were factors that predict SRH was conducted. The final model statistically significantly predicted the dependent variable over and above the intercept-only model, $X^2$ (3) = 42.829, $p$ <.001. The odds of did breathing exercises as a part of yoga having higher SRH was .739, 95% CI [.554, 987] times that for not did breathing exercises as a part of yoga $x^2(1) = 4.211$, $p$

= .040. The odds of did meditation as a part of yoga having higher SRH was .677, 95% CI [.473, .986] times that for not did meditation as a part of yoga past 12 months $x^2(1) = 4.575$, $p = .032$. The odds of not had high cholesterol in the past 12 months having higher SRH was .815, 95% CI [.708, .937] times that for had high cholesterol in the past 12 months $x^2(1) = 8.217$, $p = .004$.

Table 13

*Research Question 4 Breathing and Meditation*

| Parameter Estimates | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 95% Wald Confidence Interval | | Hypothesis Test | | | | 95% Wald Confidence Interval for Exp(B) | |
| Parameter | B | Std. Error | Lower | Upper | Wald Chi-Square | df | Sig. | Exp(B) | Lower | Upper |
| Had High Cholesterol Yes | -.205 | .0715 | -.345 | -.065 | 8.217 | 1 | .004 | .815 | .708 | .937 |
| Had High Chol No | 0[a] | . | . | . | . | . | . | 1 | . | . |
| Did Breathing No | -.302 | .1473 | -.591 | -.014 | 4.211 | 1 | .040 | .739 | .554 | .987 |
| Did Breathing Yes | 0[a] | . | . | . | . | . | . | 1 | . | . |
| Did Meditation No | -.391 | .1826 | -.748 | -.033 | 4.575 | 1 | .032 | .677 | .473 | .968 |
| Did Meditation Yes | 0[a] | . | . | . | . | . | . | 1 | . | . |

## Summary

This study explored the associations of the factors and covariate to the dependent variable of SRH. Women were more likely to have higher SRH if they practiced yoga, breathing, meditation, and were teachers. Thus, the null hypothesis for research question one was rejected. The participants who were not told by a Doctor to increase activity had a healthy weight BMI and practiced the components of yoga were also more likely to have higher SRH. The null hypothesis for research question two was rejected. Not having

hypertension and practicing the yoga components were associated with SRH. Thus, the null hypothesis for research question three was rejected. Participants who did not have high cholesterol and practiced the components of yoga were more likely to have higher SRH. Therefore, the null hypothesis for research question four was rejected.

Chapter five will provide an interpretation of the research findings. A review of the findings in the context of the current literature will be presented. Limitations of the study and implications for social change will also be presented in Chapter five.

# Chapter 5: Discussion, Conclusions, and Recommendations

## Introduction

The purpose of this quantitative study was to explore whether practicing the components of yoga, recommendations for increasing activity, age, teacher occupation, BMI, hypertension, and high cholesterol could predict SRH. Women in the United States have a higher mortality rate than women in other high-income countries and suffer from higher rates of drug overdose, suicide, heart disease, and cancer (The National Institute of Health Office of Research on Women's Health, 2019). But researchers have shown that those who practiced yoga had increased general well-being and lower rates of chronic diseases (Haier et al., 2018; Cramer et al., 2017; Cramer et al., 2016). Yoga has also decreased work-related burnout (Grensman et al., 2018). Teachers who participated in yoga have had a higher sense of well-being and decreased levels of work-related stress (Hepburn & McMahon, 2017). Thus, researchers identified a need for more public health research on yoga as a population health intervention (Bazzanao et al., 2018; Hepburn & McMahon, 2017; Harris et al., 2014; Telles et al., 2018).

The data were analyzed using ordinal logistical regression. Results indicated that practicing the components of yoga was associated with higher SRH. Teaching as an occupation was associated with higher SRH, and as age increased, so did the odds of better SRH. Results also revealed that those with a healthy BMI did not have hypertension, did not have high cholesterol, and were not told by a doctor to increase activity had higher odds of having better SRH. The following sections of Chapter 5 contain the interpretation of the findings, the limitations of the study, the

recommendations for future research, the implications for social change, and the conclusion of the study

## Interpretation of findings

### Research Question 1

In this research, yoga, breathing, meditation, were predictors of higher SRH. The results were similar to previous researchers who found that those who practiced yoga had increased general well-being (Atkinson & Prmuth-Levine, 2009; Birdee et al., 2017; Cramer et al., 2016; Kabiri et al., 2018; Leischner, 2015; Wertman et al., 2016). Additionally, several studies have also included regression analyses to determine predictors of SRH in women (Lee & Short, 2017; von der Lippe, & Rattay, 2016; Wertman et al., 2016; Yamashita, Bardo, Liu, & Yoo, 2019;). Recent research supports this study's findings that mind–body practices were associated with higher SRH (Pandya, 2019; & Wertman et al., 2016). For example, Radmark, Hanson, Horwitz, and Osika (2017) found that those who practiced mind–body exercises such as yoga had lower SRH, which is why doctors in Sweden often prescribe mind–body exercises for patients suffering from poor mental well-being.

The results also indicated that increased age was associated with predicting higher SRH. This is supported by previous research such as Janus and Smrokowska-Reichmann (2018), who stated that older women associated health as the most important factor in increased happiness and well-being, which they improved through activities like attending classes for seniors and making new connections with others. Park et al. (2015) also stated that practicing yoga increased the ability to be in the moment and fostered a

sense of connection to others. Further, Jackson (2005) said that times when a person is grounded in the here and now could increase happiness and well-being.

Finally, the results for Research Question 1 suggested that teaching as an occupation was a predictor of higher SRH than other occupations. Previous research also supported this finding. The CDC (2018d) stated that opportunities that increase social connection in the workplace help to promote a feeling of well-being, which teaching can include. According to Abdin et al. (2017), workplace wellness yoga interventions could increase participants' well-being through connection with a greater purpose. Therefore, the findings were congruent with the existing research.

**Research Question 2**

The results of the analysis indicated that practicing the components of yoga, BMI category, and being told to increase activity were predictors of SRH. For instance, women who participate in yoga are more likely to be more physically active (Cramer et al., 2017; Kabiri et al., 2018; Strowger et al., 2017). Yoga may be a platform for increasing activity in people with overweight or obese BMI (Yang & James, 2014). Recent research has shown that participating in yoga improves BMI (Haider et al., 2017; Larson-Meyer, 2016; Leischner, 2015).

In this study, being told by a doctor to increase physical activity was associated with lower SRH. Keyvanara, Karimi, Mohamadi, and Bahrami (2017) stated that those with chronic disease may increase physical activity due to doctor's recommendations, and older patients can benefit from the asanas of yoga to increase strength and balance. Further, Johnson et al. (2018) said participants that retirees were more likely to follow

doctor's recommendations for increasing physical activity because of perceived benefits to health and well-being. Older adults choose to follow recommendations as a way of restructuring goals, increasing social interactions, and increasing longevity (Johnson et al., 2018). Although most physicians do not give physical activity counseling for general health, about 95% recommend an increase in activity for patients with chronic disease (Alahmed & Lobelo, 2019). Therefore, the results in this study related to being told to increase physical activity by a doctor could be confounded by having a chronic disease.

**Research Question 3**

The results of Research Question 3 indicated an association between practicing the components of yoga, having hypertension, and SRH. Those who practiced the components of yoga and those who did not have hypertension were more likely to have higher SRH. These data support the recent findings that those who practice yoga are less likely to have hypertension and that practicing yoga can reduce the risks of hypertension (Chu et al., 2016; Posadzki et al., 2014; Pullen et al., 2018).

Those with heart disease are more at risk for death and disability and states as well as local governments should invest in prevention strategies (Chowdhury et al., 2016). For example, yoga, breathing, and meditation practices are appropriate for those suffering from heart disease, and there is potential for yoga as a cardiovascular disease intervention (Haider et al., 2016). Those with hypertension could reduce blood pressure with yogic breathing exercises (Telles et al., 2019). Additionally, Sharma, Pailoor, Choudhary Ram, and Shrestha (2019) suggested that yoga was appropriate for those

rehabilitating from a heart attack and that yoga could be incorporated into cardiac rehabilitation. Therefore, the results of the analysis were supported by recent literature.

**Research Question 4**

Research question four explored the association between practicing the components of yoga, had high cholesterol, and SRH. Practicing yoga, breathing, and meditation, as well as not having high cholesterol, were associated with higher SRH. While high cholesterol is a risk factor for cardiovascular disease, low cholesterol levels could be a risk for suicide. Gupta (2016) said that while statins were commonly prescribed for high cholesterol, yoga may be a better option for mental well-being and emotional well-being. Lau, Yu, and Woo, (2015) stated that in a 12-week Hatha yoga intervention, participants in the yoga group reduced waist size, fasting glucose, triglycerides, and risk for metabolic syndrome.

Cham, Koslik, & Golomb (2016) said that statins prescribed for lowering cholesterol caused mood and behavioral changes that led to aggression and suicide. Daray, Mann, Sublette (2018) stated that there might be a link to low cholesterol and suicide risk. Azami, Ahmadi, YektaKooshali, & Qavam, (2019) said that after participating in a 26-week yoga intervention, the women had lower total cholesterol and lower LDL cholesterol. Yoga could be a low-cost intervention for the reduction of cholesterol in women (Azami et al., 2019). The recent literature supports the results found in this study that yoga could be used in a women's population health intervention.

## Limitations of the Study

The limitations of the study and threats to the validity may be due to the cross-sectional design, the survey questions, and self-reporting in the survey. Recall bias could influence the self-reporting of participation in yoga, breathing, and meditation, self-reporting of health outcomes, and SRH could also be influenced by recall bias. A limitation of the survey questions included the participant's comprehension of the questions. The boundaries of this study were limited to the NHIS definition of yoga, breathing exercises, and meditation. The survey did not collect the type of yoga that the participant practiced. Another limitation of the findings in this study could include confounding variables.

## Recommendations

Findings of this research study and other recent studies in the literature review report that yoga is a popular CHA that increases general well-being and decreases the risk of chronic disease. Future public health research could focus on developing yoga recommendations for women of all ages, with or without chronic disease. Future public health research could also provide guidelines for yoga protocols for those with chronic conditions such as heart disease, cancer, pain, and obesity. Future research on using yoga in workplace wellness programs could provide employers with recommendations on increasing the well-being of employees. More yoga research is needed in other occupations and underserved groups in low socioeconomic status that suffer from high rates of chronic disease and mortality. Future findings could influence policy changes that open opportunities for funding low-cost yoga programs. The NIH partnered with the

Center of Excellence for Research on Complementary and Integrative Health and could provide funding for future yoga research through grant opportunities (NIH, 2019). NCCIH has prioritized funding of mind-body research as well as pain research (NCCIH, 2019).

## Implications for Social Change

Implications for positive social change as a result of the findings of this study include an increase in yoga-based public health research, the integration of yoga as a women's health intervention, increased funding opportunities for yoga-based public health research, funding opportunities for yoga practitioners in providing low-cost yoga, and increased use of yoga-based workplace wellness interventions. This research could change the focus of public health research to include CHAs in population-based health promotion and interventions. Women in the United States participate in yoga to increase general well-being, physical activity, social cohesion, mental well-being, and emotional well-being. This research could inform policymakers, key stakeholders, employers, medical practitioners, and yoga practitioners on the potential benefits of yoga as a women's population health intervention.

## Conclusion

Women in the United States suffer from different chronic diseases than women of other high-income countries, and public health could help women through recommendations for participation in yoga. While personal well-being has declined, emotional well-being and mental well-being are a public health priority. Results of this study found that practicing the components of yoga and living free from chronic diseases

increases SRH. Recent research has shown that participating in yoga reduces the risk of chronic diseases and increases the health-related quality of life in those that have a chronic disease. Participating in yoga, breathing, and meditation can be a low-cost CHA that not only improves well-being but encourages women to find healing powers within themselves. Yoga promotes healthy choices that lead to higher SRH and increased health-related quality of life. Public health researchers should implement rigorous yoga-based studies to investigate how yoga could help women in the United States thrive and live healthier lives. Public health stakeholders should use the findings of this research to further the goal of improving population health through the recommendations for policy change in promoting the health of the country.

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