PREDICTORS OF DEPRESSION DIAGNOSES AND SYMPTOMS IN VETERANS:
RESULTS FROM A NATIONAL SURVEY

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ABSTRACT

The suicide numbers among active duty military personnel eclipsed the number of combat deaths in 2011. Before the wars in Iraq and Afghanistan, the incidence of suicide in active duty US service members was consistently 25% lower than in the civilian population. Currently military and veteran suicide rates exceed those found in the general population, with 22 per day being the most conservative estimates by the Veteran's Administration. The reasons for this are multi-faceted, with the question looming as to whether repeated ground combat tours have a deleterious effect on resilience and overall mental health. Operational tempo in the last ten years has exceeded all previous expectations and metrics; frequent trips to Iraq and Afghanistan are commonplace for this community.

The purpose of this study is to examine the relationship between ten key variables and rates of diagnosed depression and symptoms of undiagnosed depression in a national sample of veterans to generate predictive models for the condition in military veterans. This study utilized secondary data analysis of veteran respondents using the 2012 Behavioral Risk Factors Surveillance Survey conducted by the Centers for Disease Control and Prevention. Logistic regression analysis explored associations between diagnosed and undiagnosed depression in veteran respondents and independent variables including: veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability and pain, and beliefs about mental health care's usefulness. This timely and culturally-relevant line of inquiry offers insight that may guide targeted resilience programming for the veteran community.

DEDICATION

To soldiers, sailors, airmen, and Marines of every era, those I served with and those I have never met.

To my father and brother, the best Marines I know.

“Coming home is harder than fighting in the war.”

– Congressman Patrick Murphy

LIST OF ABBREVIATIONS AND SYMBOLS

ANG	Army National Guard
BRFSS	Behavioral Risk Factor Surveillance Survey
CDC	Centers for Disease Control
CF	Canadian Forces
DOD	Department of Defense
DSM-V	Diagnostic and Statistical Manual, 5 th edition
MBSR	Mindfulness-Based Stress Reduction
MFTI	Mind-Fitness Training Institute
MMFT	Mindfulness-Based Mind Fitness Training
MRI	Magnetic Resonance Imaging
MST	Military Sexual Trauma
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
PETA	People for the Ethical Treatment of Animals
PTS	Posttraumatic Stress
PTSD	Posttraumatic Stress Disorder
SEM	Social Ecological Model
SCT	Social Cognitive Theory
SSRI	Selective Serotonin Re-Uptake Inhibitors
TBI	Traumatic Brain Injury
VA	Veteran's Administration
WRIISC	War-related Illness and Injury Study Center

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I am deeply grateful for the time, energy, and editing prowess of my committee chair, Lori Turner. She supported my research interests from day one, and this product would not be nearly as quality a document were it not for her expertise. I would also like to thank all of my committee members, David Birch, Adam Knowlden, James Leeper, and Angelia Paschal for their invaluable input, inspiring questions, and support of my academic progress.

FOREWORD

My interest in this field stems from multiple sources. I served as a Marine for years both at home in garrison and abroad in Iraq, have family and friends killed or wounded badly in Iraq and Afghanistan, and believe passionately in the use of health programming that emphasizes agency and active engagement for veterans. I know how rigid and traditional the military world can be, but I also know that our current deployment rates, unconventional injuries, and increased survivability of wounds that would have killed service members decades ago [call](#) for cutting edge treatment, care, and preparation in the training environment.

The idiosyncratic messages of warrior culture make sense to me. I grew up in a military family where “civilian” was a pejorative term, synonymous with laziness or apathy. After such childhood social conditioning, there was never a question in my mind about whether I would serve. I joined the Marine Corps in college to test myself. I doubted whether twenty-mile hikes or back-breaking obstacle courses were within the scope of things I could physically accomplish. They all were, and the sense of self I gained from jumping those hurdles was an invaluable gift. I still believe that worthwhile things scare us, and that we grow from taking on challenge, but my current view of challenge for the sake of external achievement rather than personal growth is clearer.

The unforgiving culture of the Marine Corps as a service branch made sense to me after the way I grew up. Being a female officer was another opportunity to do something many couldn't, or didn't. It was an opportunity to demonstrate temerity and to perform well against

stereotype expectations. It was a chance to align myself with people I viewed as contributors in a world of those who had opted-out, even if our wars weren't something with which I philosophically agreed.

Image was still really important to me at this point, if I am being honest. I was all ego and anger. I cared about how I looked in a myriad of ways. I wanted to be a stereotypically pretty woman. I wanted to be fast and fit. I wanted to be competent, smart, and brave on the inside, but I also wanted to be seen that way by the rest of the world. I wanted to be a good person who put others before herself, and I never learned how to prioritize self-care or practice balance.

I shaped my life and my professional choices around these aims. I became a military police officer because it was as close to combat arms as a female could get, and I wanted to be a “real” Marine. I don't know where I got that definition, but I was trying to prove my toughness. To this day, I am not sure who I was trying to prove it to.

In reality, I hated law enforcement. Social by nature, it was heartbreaking to see people at their worst in the course of daily work. Watching a career end as a Marine drove drunk, or showing up at a home right after someone brutalized their spouse took a toll on me. Law enforcement requires a level of emotional detachment I never possessed, so I faked it.

In those early years as a Marine, I got very good at presenting a veneer of stoic professionalism while feeling something different inside. The first time I counseled someone old enough to be my parent, encountered blatant misogyny from a supervisor, or made a decision I wasn't sure about – I was quaking inside but never let it show. Again, presenting the certain,

effective façade required some incredibly useful skills – skills that become incredibly destructive when you never learn how to turn them off. I was an ego-driven performance junkie well before I joined the Marine Corps, but that environment definitely kept me on such a path.

The above description fits most Marines. We tend to be a driven, almost-comically dysfunctional lot. In my personal life, the desire to constantly display an ideal version of myself in front of others has caused incredible heartache and alienation. I have personally failed to reach out in an authentic way and went through situations involving deployment, loss, alcohol abuse, domestic violence, and divorce completely alone and in an unhealthy manner. I share this not because it is particularly interesting, but because such determined avoidance of care-seeking is particularly common and normal in the military community I call home.

Especially in the post 9-11 military community at war, where we are so invested in our ego identity as nation-builders and in presenting an image of strong silence, we have to be honest about where we are hurting, or where we fell down. I fell down hard in my personal life, and it took me too long to get back up because I didn't know that people might be okay with an imperfect version of me. I chose drinking to escape over reaching out to loved ones, silence over openness and vulnerability. Right now we are losing more veterans to suicide than to combat. I'm a pretty decisive person with limited ability to ask for help and zero trouble taking risks - I could have been one of those statistics.

What if I had completed training designed to increase self-awareness and promote resilience, and learned to frame self-care as intelligent preparation rather than an indulgence? What if depression or Posttraumatic Stress was something I knew to look for in myself and

others rather than ridicule as the province of the malingerer? Could I have taught, trained, and equipped my young recruits better at Parris Island if I understood how widespread Military Sexual Trauma was at the time?

A basic review of the literature on veteran depression and suicide highlights that existing gaps in mental health service provision are created largely by stigma against seeking care. I know this to be true on both an academic and a personal level and believe we need to alter the dialogue about resilience. As health promoters, we must flip the current paradigm and turn words that currently connote weakness (like authenticity, self-care practices, and social cohesion) into training mandates and metrics of performance. This project is merely a starting point; there is tremendous work to be done.

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CHAPTER 1

INTRODUCTION

Purpose and Significance

The military of the United States has a long history; since Congressional formation in 1775, serving personnel have been involved in foreign skirmishes, peace-keeping missions, conflicts, and wars (Bradford, 2003). Since 2001, the military has been engaged on multiple fronts in the Middle East, operating beyond the boundaries of standard conflict operations. Today's military personnel have been engaged in combat, nation-building, peace-keeping, and anti-terrorism operations in multiple regions including Afghanistan and Iraq for the last decade (Department of Defense, 2013). Deployment frequency and duration have exceeded all previous expectations and metrics; frequent, repeated overseas deployments are commonplace for this community. Such frequency takes its toll; the suicide numbers among active duty military personnel eclipsed the number of combat deaths in 2011 (Hoge & Castro, 2012).

Understanding depression rates in the veteran community requires understanding warrior culture (CBS News, Mar 3, 2013; Malmin, 2013). Warrior culture, found in military and law enforcement settings, is characterized by a high degree of community insularity and antipathy towards displays of emotion or need. While clinical health services exist for personnel with existing mental health conditions like posttraumatic stress, (in earlier periods called posttraumatic stress disorder), they are not adequate; the rising tide of service related suicides continues (Coughlin, 2012). Gaining a better understanding of depression in the veteran

population is vital to health promotion programming for the military community. The purpose of this study was to examine the relationship between ten key variables and rates of diagnosed depression and symptoms indicating undiagnosed depression in a national sample of veterans to generate predictive models for the condition in military veterans.

To explore this complex subject, this study examined correlations between predictive variables and diagnosed depression as well as one variable indicating the presence of important symptoms indicating undiagnosed depression. This study enhanced information available on veteran mental wellness by examining diagnosed depression and determinants of depression.

A quantitative approach was utilized to generate predictive models. A secondary data analysis of veteran respondents from the 2012 Behavioral Risk Factors Surveillance Survey conducted by the Centers for Disease Control and Prevention generated the data for analysis. A cross-sectional design (n=54,060) allowed for demonstration of variable correlation.

Logistic regression analysis was chosen to explore linkages between diagnosed and symptoms indicating undiagnosed depression in veteran respondents and veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability, and beliefs about mental health care usefulness. The results should assist in the development of an increased and broadened understanding of depression in American veterans and created predictive models for outcome variables including diagnosed depression and symptoms indicating undiagnosed depression.

Implications

In order to investigate potential relationships between the outcome variables of diagnosed and undiagnosed depression in veterans and predictor variables and put them to use in future health programming, a clearer understanding of barriers to mental health care within warrior culture is required. Understanding culture is key to deciding upon behavioral change theories that can be useful for program design. Warrior culture indicates a need for models focused on individual agency and asset-based approaches (Malmin, 2013). Information presented in chapter 2 suggests that the existing standard of care for veteran mental health treatment, characterized by a disorder-treatment focus, may miss the mark when targeting this audience.

Warrior subculture creates a powerful mandate for peer-to-peer outreach and avoidance of enforced patient-identities. Issues of stigma present readily, and any message aimed at decreasing stigma must come from members of the community to be deemed credible. Warrior cultures have their own exclusive, idiosyncratic temperaments. Service members tend to be a very closely-knit group who are suspicious of outsiders (Malmin, 2013).

A thorough review of the literature presented in Chapter 2 suggests that to combat veteran depression, health promotion professionals must understand the confluence of warrior culture and mental health issues in the veteran community. The literature hints that a new approach may be required, one that embraces peer-education and speaks to the participatory, hard-working ethos of military culture. Relying upon emerging theories of resilience for health programming may provide a blueprint for success in working with this population. Veterans

often reject patient identities, which creates a major barrier to care for mental health in this population (Hoge & Castro, 2012).

The present study's analysis of both demographic and behavioral health predictor variables can be used help health promotion professionals seeking to target depressed veterans effectively, and expands the knowledge base around symptoms that may indicate undiagnosed depression in this unique community. The purpose of this study was to examine the relationship between ten key variables and rates of diagnosed depression and symptoms indicating undiagnosed depression in a national sample of veterans to generate predictive models for the condition in military veterans. The correlates produced by analyzing data from the 2012 BRFSS suggest new directions for health educators seeking to improve program targeting for military veterans suffering from depression.

Research Questions

The following research questions were developed in order to investigate the possible relationship between variables and veteran depression.

Research Question 1: To what extent are the predictor variables of veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability and pain, and beliefs about the utility of mental health treatment associated with diagnosed cases of depression in veterans?

Research Question 2: Do significant variables correlate in multivariate analysis with diagnosed cases of depression in veterans?

Research Question 3: To what extent are the predictor variables of veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability and pain, and beliefs about the utility of mental health treatment associated with self-reported feelings of poor mental health that may indicate undiagnosed depression in veteran respondents?

Research Question 4: Do significant variables correlate in multivariate analysis with self-reported feelings of poor mental health that may indicate undiagnosed depression in veteran respondents?

Hypotheses

To address the research questions, two primary outcome variables were investigated: diagnosed depression and symptoms indicating undiagnosed depression. Both variables were operationalized as dichotomous, categorical variables. The independent variables examined included: veteran era, sex, ethnicity, race, relationship status, physical inactivity, binge drinking, smoking, physical disability, and beliefs about mental health care usefulness. The rationale for selection of variables was based on general demographics and factors purported to impact mental health identified in the literature. As the relationship of each independent predictor variable and outcome variables was investigated, a series of two hypotheses sets emerged. In each hypotheses set, 11 hypotheses were investigated for a total of 22 in this study. Significance levels for rejecting null hypotheses were set *a priori* at $p < .05$.

*Hypotheses set 1: Tests for relationships among predictor variables on **diagnosed depression**.*

The first research question asked: *To what extent are predictor variables of veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability and pain, and beliefs about the utility of mental health treatment associated with diagnosed cases of depression in veterans?* Ten hypotheses were generated to address this research question:

1. Null hypothesis: Diagnosed depression will not have a significant relationship with veteran era in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression/Veteran Era}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with veteran era in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression/Veteran Era}} = 1$$

2. Null hypothesis: Diagnosed depression will not have a significant relationship with sex in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression/Sex}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with sex in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression/Sex}} = 1$$

3. Null hypothesis: Diagnosed depression will not have a significant relationship with ethnicity in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression/Ethnicity}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with ethnicity in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression/Ethnicity}} = 1$$

4. Null hypothesis: Diagnosed depression will not have a significant relationship with race in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression}/\text{Race}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with race in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression}/\text{Race}} = 1$$

5. Null hypothesis: Diagnosed depression will not have a significant relationship with relationship status in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression}/\text{Relationship Status}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with relationship status in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression}/\text{Relationship Status}} = 1$$

6. Null hypothesis: Diagnosed depression will not have a significant relationship with physical activity in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression}/\text{Physical Activity}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with physical activity in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression}/\text{Physical Activity}} = 1$$

7. Null hypothesis: Diagnosed depression will not have a significant relationship with binge drinking in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression}/\text{Binge}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with binge drinking in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression/Binge}} = 1$$

8. Null hypothesis: Diagnosed depression will not have a significant relationship with smoking in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression/Smoking}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with smoking in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression/Smoking}} = 1$$

9. Null hypothesis: Diagnosed depression will not have a significant relationship with physical disability and pain in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression/Physical Disability}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with physical disability and pain in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression/Physical Disability}} = 1$$

10. Null hypothesis: Diagnosed depression will not have a significant relationship with beliefs about mental health care's usefulness in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression/Beliefs}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with beliefs about mental health care's usefulness in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression/Beliefs}} = 1$$

The second research question asked: *Do significant variables correlate in multivariate analysis with diagnosed cases of depression in veterans?* One hypothesis was generated to address this research question.

11. Null hypothesis: Diagnosed depression will not be significantly predicted by variables that demonstrated significant association in univariate analysis including: veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability, and beliefs about mental health care usefulness considered together in a sample of military veterans.

$$H_0: \beta_1 = \beta_2 = \beta_3 \dots = 0$$

Alternative hypothesis: Diagnosed depression will be significantly predicted by variables that demonstrated significant association in univariate analysis including: veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability, and beliefs about mental health care usefulness considered together in a sample of military veterans.

$$H_0: \beta_1 = \beta_2 = \beta_3 \dots \neq 0$$

*Hypotheses set 2: Tests for relationships among predictor variables on **symptoms indicating undiagnosed depression**.*

The third research question asked: *To what extent are predictor variables of veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability and pain, and beliefs about the utility of mental health treatment associated with self-reported feelings of poor mental health that indicate undiagnosed depression in veteran respondents?* Ten hypotheses were generated to address this research question:

12. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with veteran era in a sample of military veterans.

$$H_0: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Veteran Era}} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with veteran era in a sample of military veterans.

$$H_A: OR_{Symptoms\ of\ Undiagnosed\ Depression/Veteran\ Era} = 1$$

13. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with sex in a sample of military veterans.

$$H_0: OR_{Symptoms\ of\ Undiagnosed\ Depression/Sex} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with sex in a sample of military veterans.

$$H_A: OR_{Symptoms\ of\ Undiagnosed\ Depression/Sex} = 1$$

14. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with ethnicity in a sample of military veterans.

$$H_0: OR_{Symptoms\ of\ Undiagnosed\ Depression/Ethnicity} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with ethnicity in a sample of military veterans.

$$H_A: OR_{Symptoms\ of\ Undiagnosed\ Depression/Ethnicity} = 1$$

15. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with race in a sample of military veterans.

$$H_0: OR_{Symptoms\ of\ Undiagnosed\ Depression/Race} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with race in a sample of military veterans.

$$H_A: OR_{Symptoms\ of\ Undiagnosed\ Depression/Race} = 1$$

16. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with relationship status in a sample of military veterans.

$$H_0: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Relationship Status}} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with relationship status in a sample of military veterans.

$$H_A: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Relationship Status}} = 1$$

17. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with physical activity in a sample of military veterans.

$$H_0: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Physical Activity}} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with physical activity in a sample of military veterans.

$$H_A: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Physical Activity}} = 1$$

18. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with binge drinking in a sample of military veterans.

$$H_0: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Binge}} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with binge drinking in a sample of military veterans.

$$H_A: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Binge}} = 1$$

19. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with smoking in a sample of military veterans.

$$H_0: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Smoking}} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with smoking in a sample of military veterans.

$$H_A: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Smoking}} = 1$$

20. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with physical disability in a sample of military veterans.

$$H_0: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Physical Disability}} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with physical disability in a sample of military veterans.

$$H_A: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Physical Disability}} = 1$$

21. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with beliefs about mental health care's usefulness in a sample of military veterans.

$$H_0: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Beliefs}} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with beliefs about mental health care's usefulness in a sample of military veterans.

$$H_A: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Beliefs}} = 1$$

The final research question asked: *Do significant variables correlate in multivariate analysis with self-reported feelings of depression in veteran respondents?* One hypothesis was generated to address this research question.

22. Null hypothesis: Symptoms indicating undiagnosed depression will not be significantly predicted by variables that demonstrated univariate association including: veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, and physical disability, considered together in a sample of military veterans.

$$H_0: \beta_1 = \beta_2 = \beta_3 \dots = 0$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will be significantly predicted by variables that demonstrated univariate association including: veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, and physical disability, considered together in a sample of military veterans.

$$H_A: \beta_1 = \beta_2 = \beta_3 \dots \neq 0$$

Assumptions

One assumption of this study is that participants answered survey and interview questions honestly. Another assumption is that the 2012 Behavioral Risk Factor Surveillance Survey (BRFSS) conducted by the Centers for Disease Control and Prevention (CDC) is a reliable instrument. The BRFSS is based on a current, national, and random sample of veteran respondents.

Limitations

A number of limitations are acknowledged regarding this study, including its overall exploratory nature. Secondary analysis of 2012 BRFSS survey data, while providing a large, randomly-selected sample of veteran respondents, limited the scope of questions that could be asked about predictive variables and veteran depression. Data are self-reported, which could be problematic due to respondent recall or reluctance to answer sensitive, personal questions honestly. The most likely variables to present such difficulty are those which ask about stigmatized behaviors like drinking and smoking. However, the use of self-report in survey-based research in the field is both accepted and common (Alvarez, Canduela, & Raeside, 2012).

Another limitation is the cross-sectional nature of this study's design, providing information from one snapshot in time from survey respondents. Such a design limits the conclusions that can be drawn, providing information about correlation, not direct causation. Cross-sectional research is respected and acceptable in the field, as it not only provides information about problem magnitude at a given survey point, but designed to go one step farther, can establish relationships between predictor variables and the health problem. Such research is commonly used as a baseline for health promoters designing programs (Lundberg, 2003).

Delimitations

The parameters of this study consisted of secondary data analysis of a national sample of veteran respondents to the 2012 Behavioral Risk Factor Surveillance Survey (BRFSS) conducted by the Centers for Disease Control and Prevention (CDC). The study was delimited to participants who responded to questions about veteran era, sex, ethnicity, race, relationship status, physical inactivity, binge drinking, smoking, physical disability, and beliefs about mental health care, and on rates of self-reported and diagnosed depression in veterans. The study was delimited to non-institutionalized veterans who were surveyed during the national BRFSS phone canvass process. The sample did not include veterans in institutions, homeless, or those who had already completed suicide attempts, potentially resulting in underrepresentation of depression rates in veterans by eliminating the most serious cases. Information on the specific treatment protocol depressed veterans may have undergone was not available using this data set.

Terminology

BRFSS. The Behavioral Risk Factor Surveillance Survey (BRFSS) conducted by the Centers for Disease Control and prevention (CDC) is an annual survey delivered across the country by state health departments that provides important information about behavioral health practices and indicators in sampled respondents. It is based on a current, national, and random sample of respondents from across the country. The BRFSS inquires about a number of demographic, health, and behavioral issues and provides comprehensive analysis opportunities for a broad range of health topics. The survey consists of a main document and optional modules, and is delivered telephonically by trained personnel affiliated with state and local health departments (Centers for Disease Control and Prevention, 2014).

Depression. A general term for a mental health diagnosis characterized by symptoms such as nervousness, hopelessness, restlessness, depression, low interest in normal activities, and/or feelings of worthlessness (Mayo Clinic, 2013). Symptoms manifest differently in individuals and to different degrees of severity, according to the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM V, 2013). The variable coded to indicate symptom presence that may indicate undiagnosed depression in this study uses respondent perception of poor mental health to indicate depression of varying severities. The BRFSS question specifically asks, “thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?” Depression symptoms are varied and present themselves differently in each individual, so perception of overall poor mental health may be a useful indication of undiagnosed depression (Mayo Clinic, 2013).

Meditation. A mindfulness-based contemplative practice aimed at promoting relaxation, improving mental focus, and reducing stress. Meditation styles vary, but typically involve stillness, quiet, and mental focus on a fixed point.

Mild Depression. While depression levels are somewhat subjectively and situationally-diagnosed, guidelines related to symptom persistence and duration exist. Mild depression manifests as feelings of nervousness, hopelessness, restlessness, depression, low interest in activities, and/or worthlessness for a short period of time. Mild depression is the most easily-treated category, and the most frequently undiagnosed (Mayo Clinic, 2013). The Diagnostic and Statistical Manual, 5th edition classifies mild depression as low levels of symptom displays and effects for 5-9 days (DSM-V, 2013) in symptom severity measurements (DSM V, 2013).

Military Sexual Trauma. “Military Sexual Trauma (MST) is the term that the Department of Veterans Affairs uses to refer to sexual assault or repeated, threatening sexual harassment that occurred while the veteran was in the military” (Department of Veterans Affairs, 2014). It includes any sexual activity where someone is involved against his or her will – he or she may have been pressured into sexual activities, may have been unable to consent to sexual activities, or may have been physically forced into sexual activities. Other experiences that fall into the category of MST include unwanted sexual touching or grabbing; threatening, offensive remarks about a person’s body or sexual activities; and/or threatening or unwelcome sexual advances (Department of Veterans Affairs, 2014; Hoge & Castro, 2012).

Moderate Depression. Classified as symptom displays for 10-14 days, or more than half the days by the adult depression severity measure recommended by the DSM-V, which is adapted from the Patient Health Questionnaire-9 (DSM V, 2013).

Major Depression. Classified as symptom displays for 15 or more days, or nearly every day by the adult depression severity measure (DSM-V, 2013).

MFTI. The Mind-Fitness Training Institute is an organization of researchers and practitioners who research, evaluate, and deliver mindfulness-based resilience programming for active duty military, veterans, emergency response, and law enforcement personnel.

MMFT. Mindfulness-Based Mental Fitness Training (MMFT) is a course of study promoted by behavioral health researchers for military and emergency response personnel. The program is designed to cultivate mindfulness skills with specific exercises to build attentional control and concentration. MMFT also provides body-based self-regulation skills training for coping with the physiological and psychological effects of extreme or prolonged stress (Mind-Fitness Training Institute, 2014).

Physical Activity. Physical activity is defined as bodily movement produced by skeletal muscles that results in energy expenditure (Ceri-Ulep, Tse, & Serafica, 2011). The BRFSS defines physical activity specifically asking respondents whether they have engaged at any frequency or intensity in running, calisthenics, golf, gardening, or walking for exercise (Centers for Disease Control and Prevention, 2014).

Posttraumatic Stress/Posttraumatic Stress Disorder. Commonly referred to in contemporary mental health circles as PTS to eliminate the stigmatizing term disorder, posttraumatic stress (PTS) is a mental health condition that is triggered by an acute stress event or trauma. PTS symptoms are similar to major depression according to the DSM-V, but the condition is classified as a stress disorder, rather than a depressive disorder. Symptoms may include flashbacks, nightmares, hyper-vigilance, insomnia, and severe anxiety, as well as uncontrollable thoughts about the event (Hoge & Castro, 2012; Mayo Clinic, 2013).

Resilience. Resilience refers to the ability to adapt to negative life events, trauma, and stress. Not merely focused on surviving, but on thriving, resilience is the act of rebounding after being stretched or pressed, recovering strength, spirit, and good humor (Giles, Ruth, Mala, & Richard, 2014).

Rules of Engagement. Rules of Engagement (ROE) describe directives issued by competent military authority that delineate the limitations and circumstances under which forces will initiate and prosecute combat engagement with other forces encountered (Hoge & Castro, 2012).

Severity Measure for Depression – Adult. Adapted from DSM V’s Patient Health Questionnaire and recommended by the American Psychological Association, this simple severity measure classifies depression according to the duration of time symptoms present. Mild depression manifests as feelings of nervousness, hopelessness, restlessness, depression, low interest in activities, and/or worthlessness for a period of 5-9 days, moderate for 10-14 days, and major for 15 or more days (DSM V, 2013).

Suicide. The act of intentionally killing oneself.

Traumatic Brain Injury. Swelling and damage to the brain caused by concussive blast injuries, TBI has been discussed as a hallmark injury of the Iraq and Afghanistan conflicts. TBI has been associated with depression, chronic pain, and physical disability in veterans (Department of Veterans Affairs, 2014; Hoge & Castro, 2012).

Veteran. A veteran is a service member who participated in the military for a given period of time (Department of Veterans Affairs, 2014; Hoge & Castro, 2012).

Veteran Era. A phrase used by the Bureau of Labor Statistics to indicate service era, which indicates the time frame in which one served. Veterans are grouped into service eras

according to their age in Bureau of Labor Statistics tabulations, because Department of Defense manpower numbers indicate that most service members fall within a given demographic age range. 72% of service members are 18-30 years old (Defense Manpower Data Center, 2012). The CDC's 2012 Behavioral Risk Factors Surveillance Survey (BRFSS) asks specific questions about respondents' age and collects the data in continuous fashion. This continuous variable of age was recoded according to ranges provided by the Bureau of Labor Statistics to indicate veteran era. Recoding this variable involved taking the BRFSS continuous age variable and assigning it to categories. Veterans serving in the most recent conflicts in Iraq and Afghanistan are those between the ages of 18-34, and were coded OIF/OEF. Respondents between the ages of 35-55 were assigned the Gulf War era category, and veteran respondents over 55 fall into the category of Vietnam/Korean Era (Bureau of Labor Statistics, 2013). In this study, to further analyze the variable and differentiate between veterans of Vietnam and Korea, an additional category to those used by the Bureau of Labor will be added. Veterans 55-70 were assigned to the Vietnam era, and over 70 to Korea. Veterans' experiences in a given era are colored by the conflict that dominated their time in service and the government resources and policies prevalent during service and the transitory period immediately after leaving (Bureau of Labor Statistics, 2013).

Warrior culture. Warrior culture is the series of values and social norms shared by members of military and law enforcement units. Warrior culture is characterized by antipathy towards emotional expression and an intense insularity among group members. Warrior subculture tends to promote social norms that acknowledging emotional pain is synonymous with weakness. (Malmin, 2013).

Yoga. Yoga originated out of Indian ayurvedic medical tradition over 3,000 years ago as a means of maintaining health balance. The word is derived from the Sanskrit word for union. This system, all aimed at maintaining wellness, consists of an eight-fold path: *Yama* (rules for living in society), *Pranayama* (breathwork), *Pratihara* (detachment of the mind from senses), *Dharana* (concentration), *Dhyana* (meditation), and *Samadhi* (union with the superconsciousness or divine) (Romas & Sharma, 2010).

CHAPTER 2

LITERATURE REVIEW

The United States Military – A Brief Overview

The contemporary military's missions are varied and diverse, ranging from drug interdiction and short-term humanitarian aid missions to conflicts overseas (Bradford, 2003). To meet these requirements, active duty and reserve branches staff, train, and equip forces in readiness (Department of Defense, 2010). Active duty service branches that fall under the Department of Defense include the Army, Navy, Marine Corps, and Air Force. Falling under the Department of Homeland Security (DHS) is the Coast Guard. Each service branch also maintains a reserve component (Defense Manpower Data Center, 2012).

The total number of military personnel is over 2.7 million strong, including 1,453,436 active duty personnel and 1,315,445 reservists. The Army has the largest number of Active Duty members (561,437) followed by the Air Force (328,821), the Navy (320,141), and the Marine Corps (201,026). There are also 42,011 Active Duty members of the DHS's Coast (Defense Manpower Data Center, 2012).

Women comprise 14.5 percent of the active component. These numbers have risen every year (Department of Defense Manpower Data Center, 2012). Women are less represented in older eras of military service, and comprise close to 10% of the veteran population (Department of Veterans Affairs, 2014).

Less than one-third (30.2%) of active duty members identify themselves as a minority, though this percentage is greater in 2011 than it was in previous years (from 10.5% of officers and 28.2% of enlisted members in 1995, to 23.0% of officers and 31.7% of enlisted members in 2011). To conform to the Office of Management and Budget (OMB) directives, Hispanic is not considered a minority race designation and is analyzed separately as an ethnicity on federal surveys (Bureau of Labor Statistics, 2013). Overall, 11.2 percent of the DoD active duty force is of Hispanic ethnicity (Department of Defense Manpower Data Center, 2012).

Seventy-two percent of serving personnel are young; the largest group of active duty service members is aged 25 and younger, with the next-largest age group being 26 to 30 year-olds. Just over half are married (59.9%), which is lower than percentages recorded in prior years. In addition, 6.5% of members are in dual-military marriages (Department of Defense Manpower Data Center, 2012). Most service members (49.9%) serve one four-year term before separating from the military (Department of Defense Manpower Data Center, 2012).

Once a service member separates from active service, they are considered a veteran. During the last 20 years, the American veteran population declined as older veterans of World War II and the Korean War died. Veterans are categorized by era according to their age, making the highest number of veterans represented those of the Vietnam era who are typically between 55 and 70 (Department of Veterans Affairs, 2014). The number of recorded veterans has dropped from 27.5 million in 1990 to 22.6 million in 2010 (US Census Bureau, 2014).

Literature on Depression in Veterans

Over 19 million people in the United States are reportedly diagnosed with depression. Many others suffer without diagnosis (Craft, 2002). The signs and symptoms of depression include loss of energy, motivation, hope and zest for life and an overall feeling of worthlessness (McWilliams, Goodwin, & Cox, 2004). Prescription medication and psychotherapy are the most common forms of treatment for depression within the US. Annually, over \$53 billion is spent treating depression with prescription medications such as tricyclics, monoamine oxidase inhibitors or serotonin re-uptake inhibitors (SSRI) (Institute of Medicine, 2011). Effects are usually not seen before six weeks of drug therapy and may be dependent upon continuing medication.

Psychotherapy is another viable, yet costly, treatment option for dealing with the debilitating effects of depression. Often referred to as talk therapy, it is usually administered in individual or group psychodynamic or cognitive behavioral form. Psychotherapy can also be a lengthy and time-consuming process, subject to a host of access issues (Norris, 2003).

Studying mental health can be a complicated process, as symptoms manifest on multiple levels and vary greatly from one diagnosed patient to the next. In the military, understanding mental health is important from two key angles. Prevention of illness and stress disorders saves the services money and training time, and treatment of conditions accrued during service is an ethical responsibility (Meredith et al., 2011).

The Department of Defense and Veteran's Administration have made combatting depression from both angles a major priority, specifically because it is a known predictor of suicide (Bossarte, 2013). Suicide is a major health problem in the military community.

Conservative estimates indicate that numbers of attempts and completions have increased since 1995, and are currently hovering at 22 veterans taking their own lives each day, along with one active duty service member per day (Department of Defense, 2013). Military deployment to a war zone elevates the risk of long-term physical, psychological, and social problems and reduces overall health status (Spelman, Hunt, Seal, & Burgo-Black, 2012).

Conflicts over the last decade that have been characterized by lengthy and repeated deployments to war zones have rendered service members especially vulnerable to stressors that can impact mental well-being and cause depression of varying degrees (Gironda, Clark, Massengale, & Walker, 2006). A telephone survey of 1,965 service members who recently returned from Iraq highlighted the seriousness of the problem; 14% met criteria for PTS and major depression (Tanielian & Jaycox, 2008). A larger study the following year showed 36.9% of the 289,000 service members surveyed had some sort of mental health diagnosis (Seal et al., 2009).

Careful study of suicide risk in the military population compared to the general population shows that suicide risk is almost four times higher among young veterans than their non-serving peers, a difference made more statistically significant when analysis controls for age and time in service (Bossarte, 2013). Internationally, numbers indicate the same. A British study of recent combat veterans found the risk of suicide to be 2-3 times higher for military members than the general population, with the year immediately following discharge being a particularly risky time (Ilgen et al., 2012).

A qualitative study published in the *American Journal of Public Health* aimed to probe more deeply the issue of post-discharge suicide risk in young veterans. Researchers conducted interviews of recently-discharged troops diagnosed with depression and conducted general

surveys of separating service-members who did not have a diagnosis. Their study demonstrated that a major issue for veterans is reintegration into new roles and the loss of community felt when leaving the military. Veterans described a sense of burdensomeness and extreme disconnect from civilians. These feelings linked to a failed sense of belonging and desire for death (Brenner & Barnes, 2012). Follow-on studies focused specifically on female veterans, and found that descriptions of symptoms and feelings of disconnect were markedly similar, though more pronounced and likely to be of greater severity, potentially due to minority status and the environmental factors that accompany it (Guitierrez et al., 2013).

Understandably interested in lowering service suicide rates, researchers seeking predictors of suicidal attempts and ideations land squarely on depression and its related issues and symptoms as key (Magni, Marchetti, Moreschi, Merskey, & Luchini, 1993; Miller & Cano, 2009; Ohayon & Schatzberg, 2003). Depression is a diagnosis that covers a host of symptoms, categorized in The Diagnostic and Statistical Manual of Mental Disorders (DSM-V) by duration of symptom presence (DSM-V, 2013). Mild depression involves symptoms manifesting for more than 4 days, moderate depression for slightly longer periods, and major depression involves symptoms present almost every day for one month (Calhoun et al., 2012).

As with most psychological illnesses, symptoms manifest differently in every individual (Garcia & Petrovich, 2011). Depression red flags include feelings of sadness, grief, worry, and tension, and possible interference with daily activities as a result of these feelings (Mayo Clinic, 2013). Some people experience loss of appetite or sex drive, while others overeat or engage in promiscuous or risky sexual behavior. Highly-variant, depression is often ignored or even misdiagnosed, particularly in milder forms where treatment is most effective but diagnosis hardest to pin down (Bossarte, 2012).

One of the things that makes depression hard to recognize is this variance in symptoms between patients. When depressed, some individuals sleep too much, while others develop insomnia. (Bird, 2013; Chapman, Lehman, Elliott, & Clark, 2006; Puterbaugh, 2011). Unfortunately, insomnia worsens the condition; studies demonstrate unequivocally that problems with sleeping can have considerable deleterious effects on mental health (Ancoli-Israel, 2006; Manocchia, Keller, & Ware, 2001; Tuzun, 2007). There is reciprocity between depression and sleep problems; a study of 201 veterans in an outpatient clinic demonstrated that diagnosis of depression predicted both insomnia and increased pain severity (Chapman et al., 2006). Generalized fatigue resulting from long-term sleep problems leads to tremendous difficulty completing daily tasks and maintaining social relationships (Tuzun, 2007). Veterans of combat frequently report problems with sleeping upon returning home, partly because sleep impairment is an adaptive survival skill highly-appropriate in a combat/operational environment that translates poorly into garrison life (Hoge & Castro, 2012; Ohayon, 2005). The elevated levels of cortisol and adrenaline present in the bloodstream of chronically stressed individuals directly impair the body's ability to shut down into restorative states (Seaward, 2004).

Depression in veterans can be categorized as both diagnosed and undiagnosed. Stress and anxiety are symptoms of depression, and depressive conditions are closely related to trauma and stress-related disorders like Posttraumatic Stress (PTS); the two often co-occur (DSM V, 2013). Because of frequent deployments and repeated exposure to hostile fire, Improvised Explosive Devices, incoming mortars, and other deployment hazards, the rise of stress injury is rampant in today's military and veteran communities, but it is not a well-understood phenomenon. Statistics on PTS in veteran communities are uncertain, with estimates out of the Veteran's Administration sitting at 15-50% (Coughlin, 2012). A RAND corporation study

recently showed numbers hovering at about 20% (Acosta, Adamson, Farmer, Farris, & Feeney, 2014). Traumatic Brain Injury is also on the rise, as improved body armor and equipment keep Marines alive through explosions that used to kill (Okie, 2005; Tanielian & Jaycox, 2008).

A key outcome variable for this study is diagnosed depression, and is addressed by a survey question specifically inquiring as to whether the veteran respondent has received a clinical diagnosis of depression from a medical professional. Diagnosed depression is subject to semantic debate in the military community, and symptom overlap between depressive conditions and stress injuries often leads to misdiagnosis or confusion about co-occurring conditions (Department of Veterans Affairs, 2014). Professionals discussing the same stress injury symptoms may refer to Posttraumatic Stress (PTS) or the less-popular Posttraumatic Stress Disorder (PTSD), stress reaction, battle fatigue, operational stress, or shell shock (Hoge & Castro, 2012). These trauma and stress disorder diagnoses are often accompanied by symptoms of depression in varying degrees of severity, and this co-occurrence may or may not be understood, recognized, and diagnosed (DSM V, 2013; Hoge & Castro, 2012).

The complexity of depression diagnoses in the military is related to the nature of the human stress response and its absolutely normal reactions in combat situations. Symptoms of both stress injury and depression double as essential survival skills in a war zone (Department of Veterans Affairs, 2014). These survival responses are appropriate in a combat setting, and a warrior understands that they could be needed again in the event of another deployment or a life-threatening situation (Seaward, 2004). Stress case studies conducted by Dr. Jha of the University of Pennsylvania in 2009 studied long-term cognitive changes in soldiers and Marines post-deployment, looking at how stress reactions enable or impair mission effectiveness. The fast-moving landscape of the contemporary combat environment trains service members to respond

quickly and to spend most of their time in elevated states of alertness. This stress reactivity carries with it decreases in upper-level cognitive ability and a host of emotional, behavioral, and physiological health problems. In effect, the deployed soldiers' brains build the capacity for quick reaction over time, which is a function more necessary for survival in Iraq, while experiencing degradation of other mental capacities. Dr. Jha found that overseas deployment was correlated with memory lapses and focusing problems, a deficit that persisted more than 2 months after arriving home (Jha & Kiyanoga, 2010).

The Diagnostic and Statistical Manual of Mental Disorders (DSM V) discusses major depression as a disorder with symptoms lasting much of one month. When these symptoms manifest for shorter duration, they are categorized not as major depression, but as moderate or mild depression (DSM V, 2013). Major depression symptoms are often synonymous with commonly co-occurring Posttraumatic Stress disorders (Department of Veterans Affairs, 2014). There are seventeen key symptoms or indicators that mental health professionals use to make a PTS diagnosis, grouped into criteria (Hoge & Castro, 2012).

The first criterion is exposure to trauma of some life-threatening sort, whether witnessed or personally experienced. This may involve actual injury or simply the threat of harm to self or others. The likelihood of developing symptoms after the event depends on the individual, the proximity of the threat to self or close associates, and the amount of helplessness or betrayal felt after the incident (Department of Veterans Affairs, 2014; Hoge & Castro, 2012).

This issue of helplessness is noteworthy for combat veterans of the Iraq and Afghanistan wars, because so much of the combat involves Improvised Explosive Devices, indirect fire, and ambushes; feelings of surprise and helplessness are more likely with such contact (Bossarte, 2013). In addition, conflict that takes place within civilian centers against undefined enemies

results in extensive Rules of Engagement. Soldiers and Marines often complain of being constrained from engaging after a bomb blast due to these rules (Hoge & Castro, 2012).

The issue of betrayal after a traumatic event is a major reason that survivors of Military Sexual Trauma are at risk for developing PTS. Sexual assault commonly causes major depression in civilians, and the risk is compounded in the military because of the close nature of the working relationships between perpetrator and victim, as well as institutional issues that make prosecution of offenses unlikely. During screenings, 1 in 5 women and 1 in 100 men report experiencing Military Sexual Trauma during their time in service (Burns, Grindlay, Holt, Maski, & Grossman, 2014).

The other criteria for diagnosis of PTS in military personnel involve re-experiencing the trauma, avoidance and withdrawal symptoms, hyper-arousal symptoms, duration of symptom presence, and the interference of activity due to symptoms (DSM V, 2013). Re-experiencing often takes the form of flashbacks or nightmares, which set off the body's hormonal stress response. The stress response in overdrive is known to interfere with digestion, sleep, and emotional regulation, all of which can cause follow-on health problems for the veteran (Seaward, 2004).

The overactive stress response becomes ingrained in a patient with PTS symptoms, and a constant state of reactivity and hyper-arousal can begin to feel normal. These chronic symptoms inevitably begin to affect interpersonal relationships and functionality in public spaces, leading to withdrawal and interference with daily living for the veteran (Hoge, 2010). Such shutting down and emotional detachment may be useful combat-zone skills, but become understandably destructive when the veteran cannot turn them off (Malmin, 2013).

The physical effects of PTS on the body are indistinguishable from what happens as a result of chronic stress, as such symptoms are caused by adaptive limbic system reactions that simply go unchecked (Seaward, 2004). Unfortunately, this can make PTS diagnosis difficult, because veterans understand their symptoms to be normal behaviors for the combat environment.

Undiagnosed depression is also a common problem in the veteran population because of symptom overlap between stress conditions and depression, the stigma issues surrounding mental health care, and social norms common in warrior culture. Service-specific suicide prevention and mental health literature tell personnel to look for key symptoms in themselves and in others. Personnel manifesting lingering sadness and grief or experiencing an abnormal amount of tension may notice that their ability to work and participate in normal activities becomes affected. In these instances, depression is a serious possibility (Hoge, 2010).

For this reason, one outcome variable chosen in this study includes a question that specifically addresses the presence and duration of poor mental health symptoms. It is likely to paint a picture of the prevalence of undiagnosed depression, and may increase our understanding of the scope of the issue in veterans. As current estimate ranges are unclear and swing wildly between 15-50%, this would be tremendously useful (Brenner & Barnes, 2012). The Department of Defense and Veterans Administration are keenly interested in studying ways to reduce suicide rates through preventing and treating PTS and the co-occurring serious depressive disorders that often impact service members (Libby, Corey, & Desai, 2012).

The Confluence of Warrior Culture and Depression in Veterans

Understanding the Culture

Whether approached from a treatment or prevention standpoint, addressing depression in the veteran community requires understanding the unique and treatment-recalcitrant military culture in which this phenomenon is occurring (Malmin, 2013). Changing community notions about mental health care requires an understanding of warrior culture, and a health educator's eye for audience-centered communication.

In a descriptive case study published by the *Journal of Religious Health*, Dr. Mark Malmin provides an in-depth review of warrior culture, using the military and law enforcement communities as his frame of reference. A former soldier and police officer himself, Malmin approaches his descriptive analysis with an insider's eye. Using a review of research consisting primarily of survey data and his own interviews and observations of soldiers and law enforcement personnel, Malmin paints an accurate, vivid picture of the insular culture in which warriors exist. In so doing, he highlights the power of subculture influence on member perception. Warrior subculture tends to promote ideologic thinking that acknowledging emotional pain is synonymous with weakness and specifically, that asking for help for emotional distress or problems is unacceptable (Malmin, 2013).

The influence of culture on behavior cannot be understated (Ahmed, 2010). Culture is an important factor that shapes individual behavior through customized sets of attitudes, beliefs, and values shared by a large population (Shiraev & Levy, 2010). One's surrounding social

norms play a vital role in shaping the attitudes and beliefs commonly used to delineate and define culture. In insular and intense communities, normative values can become highly prescriptive and are enforced in a myriad of intangible ways. Emotional norms become disciplinary tools, rendered more effective in communities with high levels of adherence to hierarchy (Ahmed, 2010). Especially in military communities that promote competitive individualism, this allows the expectations of others to weigh heavily on shoulders (Malmin, 2013; Hoge, 2010).

According to Dr. Malmin, warrior culture can distort critical thinking and good judgment in cases where warriors suppress emotional pain, fail to apply sound cognitive thinking, acknowledge real health or wellness issues, and intentionally choose not to seek help that might remedy a mental health problem. If strength is a virtue, becoming a patient is antithetical to being virtuous. The result of such a firmly-entrenched value system is powerful stigma against patient-identity and mental health conditions (Malmin, 2013). According to social worker and grounded theory researcher Dr. Brene Brown, warrior culture is opposed to vulnerability and sees outreach as weakness, yet vulnerability is key to healing and self-knowledge (Brown, 2012).

Within the military community, much of the issue lies not in lack of screening for depressive disorders, nor in the medical care available to service members suffering from depression. The problem is getting veterans to avail themselves of treatment services (Held & Owens, 2013). In one post-deployment study, 42% of screened reserve and National Guard soldiers answered questions in such a way that they were flagged as being in need of evaluations and possible treatment. However, only half of those soldiers referred sought treatment. Only 30% of those that sought treatment followed the basic program through the full eight sessions (Coughlin, 2012).

Part of the issue is the stated disconnect combat veterans feel from civilians, even civilian mental health professionals who treat the military population. Service members and veterans often feel they're wasting their time dealing with people who can't relate to their perspective, and may actually feel more comfortable in the war zone (Hoge, 2010). Another glaring problem surrounding seeking initial help and adhering to a program lies in the stigma that surrounds mental health treatment and care. This has been confirmed in study after study - when veterans were asked why they avoided even recommended care, stigma was identified as a major barrier (Currier, Holland, & Allen, 2012; Elnitsky et al., 2013; Koo, 2014). The most important challenges in suicide prevention are stigma surrounding mental illness, negative perceptions of treatment, and other barriers (including confidentiality in the military setting) that result in the majority of service members not accessing care when needed or dropping out prematurely (Held & Owens, 2013).

Researching With Warrior Culture in Mind – Applying Resiliency Theory

When analyzing a health problem within a given demographic with an eye towards guiding and targeting future intervention programming, considering behavioral change theory is potentially useful (Hayden, 2009). The question of how effective education can be in the promotion of wellness behaviors has spawned our entire field of academic study. Health Promotion and Education works to create behavioral change in target populations through a variety of methods, employing many theories of behavioral change. Such theories apply what we know about human psychology, sociology, physiology, and culture to health programming.

Many important theories and models apply psychological theories to intervention programming in a manner proven to be effective (Hayden, 2009).

One commonality the models share is a focus on the audience as unique, requiring targeted interventions. Each program is modified according to the perceptions and realities of those it is designed to impact. Culture, socioeconomics, health norms, and environment are huge contributors to health behavior (Hayden, 2009). For purposes of research in the veteran population, theory must consider culture. A review of the literature in this subject area makes clear that a commonly-understood warrior ethos in the active military and veteran communities renders theories that focus on assets and strength more useful than those focused on susceptibility or recovery (Malmin, 2013).

Resiliency Theory centers around the study and promotion of human resilience, which is the force that drives growth through adversity (Richardson, 2002). Studying resilience involves identifying the protective personality traits and behaviors that promote such growth, and looking for practical ways that programming can strengthen and encourage accessing of these traits. Resilience has been most frequently defined as positive adaptation despite adversity. Over the past 40 years, resilience research has gone through several stages (Fletcher & Sarkar, 2013). From an initial focus on the invulnerable or invincible child, psychologists began to recognize that much of what seems to promote resilience originates outside of the individual (Werner & Smith, 1982). This led to a search for resilience factors at the individual, family, community, and cultural levels.

Original research on Resiliency Theory came out of the fields of social work and social psychology, but unlike more problem-oriented theories, it came about after inquiry into characteristics demonstrated by survivors of trauma. It began first by asking the question of why

survivors fared better after difficulty than others who experienced the same events. Resilient traits were most importantly identified by the seminal work of Dr. Emmy Werner, who in 1982 published a 30-year longitudinal study on resilience in at-risk children. Her initial assessments of 700 children began in 1995, and showed that 30% of them were at-risk due to environmental factors like perinatal stress, poverty, neighborhood instability, and parental mental health problems. Of that at-risk group, 72 (about 36% of those designated as being at-risk) were thriving and achieving success despite the odds. Researchers categorized the qualities that these children commonly presented as resiliency-indicating traits. Categories that Werner noted included being female, robust, socially responsible, adaptable, tolerant, achievement-oriented, possessing excellent communication skills, and having high self-esteem (Werner & Smith, 1982).

Follow-on studies demonstrated important resilience traits in other countries and populations, with marked similarities existing in thriving survivors (Garmenzy, 1991). Dr. Michael Rutter's work with at-risk children in Britain highlighted the importance of having a relaxed attitude, demonstrating high self-efficacy, and having good social support in cultivating resilience (Rutter, 1985). Massive surveys in over 600 communities identified developmental assets in children and teens between 1990-1995, and the emerging field of Positive Psychology worked to further the research (Seligman & Csikszentmihalyi, 2000). A massive literature review published in a peer-reviewed psychology journal in 1997 found that worldwide research has demonstrated the existence of resilient traits, finding commonalities in the 50% of people who demonstrate success by societal indicators; these resilient individuals are also confident, competent, and invested in their social relationships (Bernard, 1997). The question moving

forward became not whether resilience was real, but whether it could be cultivated (Garcia & Petrovich, 2011).

Health behavior specialists focusing on the second phase of theory development interwove an understanding of self-efficacy theory into the conversation on resilience. Self-efficacy was labeled by Bandura as the most important construct of his popular Social Cognitive Theory (Institute of Medicine, 2003). Also a construct of the Health Belief and Trans-theoretical Models, well-validated and commonly-understood, self-efficacy is the level of confidence about one's capability to perform a behavior felt by an individual (Hayden, 2009).

Efficacious people are more likely to engage in preventive behaviors, adhere to desired changes, and view new challenges as eustress rather than distress. Efficacy is built several ways. Mastery experience builds confidence, as past success makes an individual feel like achievement can be repeated. Vicarious experience contributes, as well; efficacious people have seen success in action modeled for them. Typically supported people, individuals with high self-efficacy receive verbal persuasion (Hayden, 2009). Finally, a person's somatic/emotional state contributes to efficacy. Stress researchers have empirically-proven that fear, stress, and anxiety set off hormonal chain reactions in the body that elevate blood cortisol and adrenaline. This response limits upper-level cognition, impairs physiology, and reduces feelings of efficacy (Seaward, 2004). A person with high self-efficacy typically knows how to manage their stress. Numerous studies validate self-efficacy as a tool to promote positive health behaviors, and cultivating efficacy has been found to build traits that define resilience (Hayden, 09).

Once researchers identified key resilient traits and began to understand them within the constructs of the field, the focus shifted to cultivation. This is considered the Second Wave of Resiliency Theory development (Richardson, 2002). "Resilience is the natural, human capacity

to navigate life well. It is something every human being has — wisdom, common sense...The key is learning how to utilize innate resilience” (HeavyRunner and Marshall, 2003, p. 14).

Identifying resilient traits, the theory outlines processes of attaining or enriching them (Richardson, Neiger, Jensen, & Kumpfer, 1990). The result was the creation of a resiliency model, which was developed to highlight the process whereby an individual moves through stages of biopsychospiritual homeostasis. Simple studies highlighted the model’s central premise, that disruption followed by time and self-care aimed at reintegration actually cultivated resilient traits.

Researchers conducted simple demonstrations of resilience with animals in laboratory studies (Rankin, 2013; Seaward, 2004). One noteworthy endeavor used baby chickens. Painting the chicks and grouping them in separate pens, the first group was left alone to interact happily and normally. The second group was periodically picked up and stressed in a confined space. After the stress, the chick was given time back in the pen to recuperate. The third group was continually stressed in the confined space, with no recovery time. After this, all the painted chicks were placed in buckets of water, with researchers timing their struggle until drowning. The chicks that had been continually stressed drowned almost immediately. The second group to succumb was comprised of those “happy innocents” in group one who had never been confined and stressed. The last swimmers fighting to make it were the chicks from the second group. Somehow, the confinement stressors followed by time to recover had rendered them stronger and able to swim and survive much longer than their peers (Rankin, 2013). This group was resilient; they had experienced hardship before and believed they had a chance to make it and recover.

Researchers interested in psychological and social determinants of health picked up the concept of resilience and have gradually extended its use from the domain of mental health to

health in general. Early work on resilience was concerned with the individual, but more recently researchers have become interested in resilience as a feature of whole communities. Resilient traits can be taught, but this does not happen in a vacuum. Cultural analysis and applicability are vital (Richardson, 2002).

Such cultural consideration defines modern Resiliency Theory; this third wave of Resiliency Theory builds upon existing ecological theory work in Health Promotion (Richardson, 2002). There is a tremendous history of environmental study in the field. Historically, social psychology theories working to explain human behavior often confined their area of analysis to the individual. Before Lewin's work in 1935, an intrapersonal focus was standard for academics looking at how to guide human behavior. In fact, health education has often been accused of being victim-blaming in limiting its scope to the individual level, with health promotion being a more realistic paradigm through which to look at human health behavior change (Alvarez, et al., 2012).

Health Promotion expands the scope of theoretical analysis that health education has offered in the past, recognizing that the push and pull of one's environment yields tremendous influence on health behaviors. Lewin's Field Theory began this work in 1935, looking at environmental influences on behavior (Stivers & Wheelan, 1986). Social psychologists beginning to recognize the importance of environmental influences on human behavior were looking for new ways to explain such reciprocity (Hayden, 2009). Early Social Learning Theory began looking at the way environment, belief systems, attitudes, and human behavior related to one another. Subsequent developments in Social Cognitive Theory contributed to a more expansive view of health behavior influences (Bandura, 2004; Painter, Borba, Hynes, Mays, & Glanz, 2008).

Today, perhaps the most comprehensive, expansive, and well-validated (via case study) model of ecological health promotion is the Social Ecological Model (SEM). The SEM posits that health behavior is influenced by five inter-related layers. Much like SCT's theory of reciprocal determinism, SEM highlights the fluid nature of influence between each category and layer (Boon, Cottrell, King, Stevenson, & Millar, 2012).

Third wave Resiliency Theory is grounded in the SEM and also works to apply questions of environment and culture to any study of individual resilient traits, with the goal being more effective cultivation of those traits (Richardson, 2002). This wave is influenced by postmodern, multidisciplinary efforts to identify motivational forces both in individuals, groups, and larger communities while simultaneously analyzing context and group experience.

Resiliency Theory as it applies to health behavior change is a powerful paradigm from which to approach research and programming, primarily because it promotes a model of agency and client control. Research has shown that, indeed, much of what seems to promote positive adaptation despite adversity does originate outside of the individual — in the family, the community, the society, the culture, and the environment (Richardson et al., 1990). Further research has led to the concepts of resilient reintegration, whereby a confrontation with adversity can lead for some to a new level of growth, indicating that resilience is something innate that needs only to be properly awakened (Fleming and Ledogar, 2008).

“The health education and prevention professions are in the midst of a philosophical revolution attempting to build upon negative risk reduction programs, which are driven by the medical model, to competency models” (Richardson et al., 1990, p.33). Particularly in marginalized or insular communities, a capacity assessment emphasizing positive assets is vital (Whiting, Kendall, & Wills, 2012). To this end, basic asset mapping can be done in partnership

with key informants from the target community. Asset mapping requires a listing of building blocks available to the health promotion team. Primary building blocks are easy to access because they are internal to the community. These may include schools, community centers, or anything controlled by key community members. Secondary building blocks are the resources that reside in a community run by outsiders. Chain stores, some non-profits, universities, and hospitals are good examples. Exploiting secondary building blocks requires collaborative partnerships. Potential building blocks may be less-accessible, as they are externally-controlled and located outside the community. A prime example can be found in the grant funding mechanism. The resource is available, but only to those who know how to compete for it in an increasingly selective process. Exploiting potential building blocks requires not just understanding of individual resilient traits, but a true partnership with the target population and training and expertise to improve access opportunities (Whiting et al., 2012).

Noted psychologists and psychiatrists have suggested that competency and resiliency characteristics are strengths that are more protective than risk reduction efforts (Connor & Davidson, 2003). Tested specifically for validity in military communities, resiliency scales measuring traits that offer protective effects against depression emphasize adaptability (Green et al., 2014).

The expanded view of health education and disease/illness prevention that a resiliency-based prevention-focus offers includes perspectives on the value of personal disruption and adversity as avenues to promote growth. Such disruption handled in adaptable fashion can increase protective factors against post-trauma depression and anxiety (Fleming & Ledogar, 2008). The process of psychological reintegration is the ability to learn new skills from the disruptive experience and put life's perspective back in a way that will increase abilities to

negotiate life events (Richardson, 2002). Research examining the role of protective factors in buffering against PTSD and depressive symptoms in veterans is limited, but early studies show promise. A pilot study of 272 returning National Guard soldiers after a deployment to Iraq demonstrated that high levels of resilience characteristics fully mediated the likelihood of self-reported depressive symptoms (Pietrzak, et al., (2010).

Working with veterans and military personnel who have been subject to the stresses and traumas of the last decade of war requires a focus on agency and resilience, not simply an understanding of the scope and seriousness of depression problems in the target group. By framing an understanding of veteran depression within a clear understanding of warrior culture and operating from the paradigm of the contemporary Resilience Model, health-promoting inroads may be made that heretofore have not been in this population.

The relationship between exposure to combat stressors and poorer post deployment health is well documented (Coughlin, 2012; Hoge, 2010). Still, some individuals are more psychologically resilient to such outcomes than others, and increasing understanding of resilience within given communities and populations may help target programming (Richardson, 2002).

A 2013 Canadian study assessed the criterion validity of a model of psychological resilience composed of various intrapersonal and interpersonal variables for predicting mental health among Canadian Forces (CF) members returning from overseas deployment. Participants included 1,584 male CF members who were deployed in support of the mission in Afghanistan between 2008 and 2010. The results demonstrated the importance of resilient traits in predicting better mental health in Canadian veterans, and emphasized the protective nature of conscientiousness, emotional stability, and positive social interactions (Lee, Sudom, &

Zamorski, 2013). The more prominent traits indicating resilience that a soldier had, the better their mental health after returning from combat.

The challenge for health professionals looking to stem the tide of service suicides and improve quality of life for veterans lies in shifting the paradigm away from a focus on problems and towards theories and methods of resiliency cultivation, preparation, and self-care practices. The Department of Defense has begun to see the validity of such behavioral health interventions in Wounded Warrior recovery programs aimed to treat service members with existing cases of depression, and is slowly expanding research partnerships with universities like the Uniformed Services University of Health Sciences, Columbia, Johns Hopkins, Georgetown, and American University in Washington DC to validate such treatment methods. Some of the research efforts are explicitly clinical, and apply rigorous prospective, mixed-methods models (Libby et al., 2012).

For example, a recent study in the District of Columbia in partnership with the DC Veteran's Hospital, American University's Psychology Department, and the War-Related Illness and Injury Study Center (WRIISC) yielded promising treatment results for mindfulness meditation interventions. Researchers worked with patient volunteers to advance current understanding of veterans with dual-diagnoses of Traumatic Brain Injury (TBI) and Posttraumatic Stress (PTS) through the lens of neuroscience. Looking at brain scans in individuals with these diagnoses and comparing functional MRI results pre and post intervention, researchers ascertained whether and when stress hormone levels drop with intervention and compared those results to self-reported pain management. Meditation may reduce physical symptom complaints and improve emotional functioning in patients suffering from chronic pain (Nassif, Norris, Gomez, Karch, & Chapman, 2013).

Both cultural analysis and examination of ecologically-focused Resiliency Theory suggest that the ways health promoters bring programs to veterans must emphasize assets and agency. The best method for testing such a suggestion is thorough program evaluation.

Delivering Programs with Resiliency Theory & Warrior Culture in Mind

Research conducted to evaluate existing programs and interventions often uses process, impact, and outcome evaluation methods. Programs aimed at improving resilience and preventing depression abound, but assessment standardization does not (Coughlin, 2012). In the military community, the best program implementation cases are found within participatory research frameworks. Because of military culture insularity and lack of communication between bureaucratic treatment agencies, programs that seek to collaborate, bridge gaps, and use peer leadership meet with track-able success (Meredith et al., 2011). Warrior subculture creates a powerful mandate for peer-to-peer outreach. Any message aimed at decreasing stigma must come from members of the community to be deemed credible. Recall that a major symptom of service members separating, especially after a combat deployment, is a feeling of disconnect from civilians (Hoge, 2010). Warrior cultures have their own temperaments, typically exclusive and mistrustful of outsiders with different life experiences (Malmin, 2013).

A 2010 case study highlights one Michigan pilot program's experience with "buddy-to-buddy" peer support programs. A team from the University of Michigan and Michigan State worked with the Army National Guard (ANG) to address the constellation of issues facing soldiers returning from a deployment to Iraq. The primary strength of the Michigan case study was the thorough formative research conducted by the academic team. They surmised quickly

that while the stresses soldiers faced were unique, the clinical resources available to them were noteworthy and present. Gaps existed in all of the expected areas – soldiers faced inexorable stigma associated with seeking care (Greden et al., 2010).

Michigan researchers also keenly understood the need for audience-centered communication, and partnered with unit leadership to institute a program that was completely peer-led. This decision came out of the qualitative research they conducted in the unit prior to thinking about a program. Interviewees said things like, “if you haven’t been there, you don’t get it” and “other veterans can be trusted.” The research team considered concepts of warrior culture and sought to design a program that spoke the correct language, using an understanding of social norms to change the culture of treatment avoidance (Greden et al., 2010).

Partnering with unit leaders to conduct formative research and develop the peer support program with those partners allowed for an implementation opportunity that is the focus of their 2010 published case study. After training 350 peer leaders, (called “Buddy Ones” by the program), one returning unit participated in the program. Data collection methods for this pilot involved zero observation of buddy mentoring sessions, as outside eyes would hamper the process. Instead, the research partnership used surveys and interviewed participants.

Preliminary results were encouraging. Ninety percent of participants understood program intent, received regular calls and contact from their buddies, and felt comfortable with their trained peer. More than 20% were referred to formal treatment by their buddy, and this group affirmed availing themselves of recommended services (Greden et al., 2010). . As a pilot study, the Michigan buddy program is light on long-range evaluation results, but advances greatly the notion that attention to warrior culture, unit-specific language, peer leadership, and insider message delivery can aid in suicide prevention. All of these program components increase entry

into existing treatment programs. This focus on stigma reduction and improved rates of treatment-seeking is of paramount importance (Greden et al., 2010).

National Guard soldiers, like all reservists, often face stresses additional to those faced by active duty troops. Reservists don't come from as insular of a military community, and may lack support services in civilian community settings. Particularly because PTS symptoms are very likely to be misread as behavioral deviance, stigma may be even more difficult to overcome in community settings removed from the active duty military component (Greden et al., 2010).

Resiliency Theory suggests that the future may lie in preventive behavioral health interventions aimed at healthy service-members in the training environment, building capabilities before exposure to trauma occurs. Honing in on the need for culturally-sensitive resilience training is Dr. Elizabeth Stanley of the Mind Fitness Training Institute. Dr. Stanley is a former Army Captain with deployment experience in Korea and Bosnia. She is a professor of Security Studies at Georgetown who has invested a great deal of personal time and training energy into behavioral health practices aimed at improving working memory capacity. Dr. Stanley developed the Mind-Fitness Training Institute specifically with high-stress organizations like the military in mind, citing the tremendous need to build resilience in a community under repeated and extreme chronic stress (as the norm rather than the exception). The Institute's focus is on training instructors and providing services, but also gets involved in research initiatives (Mind-Fitness Training Institute, 2014).

Interestingly, high stress reactivity, naturally-occurring adaptation though it may be, hinders the ability of service members to perform complex missions and interact with foreign nationals. The modern battlefield involves interaction with civilians and allies as a matter of course (Hoge, 2010). Becoming overly-reactive as a response to environment hinders that

mission. For example, soldiers who screened positive for mental health problems were three times more likely to report having engaged in unethical behavior while deployed (Jha, Stanley, Kiyanoga, Wong, & Gelfand, 2010). Behaviors ran the gamut from unnecessary property damage to noncombatant injury or harm, all diametrically opposed to the United States' mission of winning hearts and minds.

The Mind-Fitness Training Team conducted a specific study on a company of Marines in the fleet during pre-deployment work-ups, seeking to answer the question of whether a mindfulness-based behavioral health intervention could improve the resilience of Marine Corps reservists preparing for a tour in Iraq and prevent depression problems after returning home. Attempting a mixed-methods approach to the explanatory/instrumental case study, the researchers studied one unit of 34 reservists in the pre-deployment work-up phase. In addition to the normal training required before heading overseas, these reservists underwent a carefully tailored yoga and mindfulness program designed to improve their ability to manage both chronic and acute traumatic stress (Teng et al., 2013).

Results were statistically significant in the studied population, demonstrating that adherence to intervention protocol for 15-minutes each day exponentially improved working memory capacity (Teng et al., 2013). Working memory capacity contributes to emotional regulation as well as upper-level cognitive functioning (Mayo Clinic, 2013).

Most of these reservists had already deployed once before or worked in civilian occupations like law enforcement that could be classified as high-stress. Researchers cogently made the point that using the small detachment of Marines as their case report group rather than a single individual was intended and more appropriate for analysis. Their goal was not narrative emotional power, but a mixed-methods analysis that may carry weight with a command

considering program adoption beyond the bounds of the short case study (Teng et al., 2013). In this, researchers affiliated with the Mind-Fitness Training Institute have been highly effective. Early findings indicate an affirmative answer to the specific question of whether yoga-based mindfulness training can promote stress resilience in a very specific population, at a very critical juncture. In order to enhance the validity of their conclusions, researchers used triangulation to answer their questions in more than one way. Methods included participant observation, individual interviews, and a battery of self-reported questionnaires aimed to assess perceived stress and personal outlook. The results showed increases in positive outlook and mindfulness skill sets and commensurate decreases in perceived stress. Researchers observed strong adoption and adherence in some participants, and the scores of those participants rose in correlation with the hours logged in practice (Teng et al, 2013).

Other researchers have followed the path of the Mind-Fitness Training Institute team and spent time attempting to validate specific interventions for the military community that both formally and informally rely on constructs of Resiliency Theory. A 2011 RAND analysis commissioned by the Office of the Secretary of Defense conducted a systematic evaluation of existing programs in different branches of service. They began by reviewing literature on psychological resilience to identify key content for recommended programming. Interviews with current resilience program leaders identified the presence or absence of such content and inquired about evaluation protocol. A noted finding of the study was that few programs currently being delivered in piecemeal fashion have any formal evaluation plan in place, though almost all those interviewed saw the need for longitudinal studies of the effectiveness of their programs (Coughlin, 2012; Foran, Adler, McGurk, & Bliese, 2012).

Study results in preventive environments are rare, but early indicators are promising. Receiving training to cultivate resilience in the pre-deployment interval may help protect against the deleterious effects of the high-stress military context on physical and psychological health (Sipe & Eisendrath, 2012). Case studies at the unit level have shown promising results, even in the confused climate that characterizes current understandings of depression in today's veterans. Improving background knowledge on behavioral predictors of depression will go a long way towards targeting programming within this community.

Predictor Variables

Because the limbic system reacts normally to life-threatening stressors by creating survival and coping behaviors that are maladaptive in a non-combat home environment, veterans suffer issues with transition at high rates (Bossarte, 2013). Warrior culture promotes avoidance of patient-identities, and as a result the problem of depression is not fully understood in veterans, especially after a decade of war characterized by an all-volunteer force deploying multiple times to theaters of war. Major depression is linked to suicide risk, and presents a major public health problem that the services struggle to deal with (Shen, Arkes, Kwan, Tan, & Williams, 2009).

The purpose of this study was to examine the relationship between ten key variables and rates of diagnosed depression and symptoms indicating undiagnosed depression in a national sample of veterans to generate predictive models for the condition in military veterans.

Demographic Predictors

Veteran era

The CDC's 2012 Behavioral Risk Factors Surveillance Survey (BRFSS) asks specific questions about respondents' age and collects the data in continuous fashion. For purposes of this analysis, these data were useful in creating a predictor variable that reflects the era from which the veteran respondent hails.

The Bureau of Labor publishes statistics and provides ranges that highlight veteran ages by era for purposes of tracking employment issues by veteran era. Veterans are grouped into service eras according to their age in Bureau of Labor Statistics tabulations, because Department

of Defense manpower numbers indicate that most service members fall within a given demographic age range. 72% of service members are 18-30 years old (Defense Manpower Data Center, 2012). Each conflict is characterized by different engagement likelihoods, manner of combat faced, and access to resources upon return to the civilian community.

Older veterans of the Korean and Vietnam era faced long deployments characterized by high-intensity conventional and guerilla warfare. Upon return home, they faced hostility and silence about the potential impact of their experiences. PTS was not yet recognized or understood, and many faced victim-blaming for their subsequent alcohol and drug abuse (Department of Veterans Affairs, 2014; Hoge 2010).

Veterans of the first Gulf War faced a long build-up to war and a very intense ground operation of short duration. The threats of chemical and biological attacks were persistent and real. Upon returning home, though public sentiment was largely supportive, institutional attention and understanding of PTS and physical problems from chemical exposure was lacking (Hoge, 2012).

OIF/OEF veterans faced over a decade of war characterized by multiple trips to theater for an all-volunteer force, with dwell time at home with families minimal. Iraq and Afghanistan lack clear front lines, and duties overlap curiously. Service members move from combat roles to humanitarian or training roles quickly. Combat is often guerilla-style, with suicide bombings and Improvised Explosive Devices serving as weapons of choice for the enemy (Department of Veterans Affairs, 2014; Hoge 2010).

This era saw increased use of women in combat roles and the rise of dual-parent families creating family deployment challenges in the home. OIF and OEF veterans come home to a supportive public and a health community working to slowly increase understanding of PTS.

Because of the increase in survivable blast injuries, health professionals are also simultaneously working to understand Traumatic Brain Injury and the way it intersects with depression (Department of Veterans Affairs, 2014; Hoge 2010).

Understanding depression risks by era may provide a host of information about the sort of risks a given conflict and resource set creates.

Sex

Historical discrimination against women in the service branches combined with cultural issues that linger in the present day can make issues of social support and unit cohesion uniquely salient for military women (Kline et al., 2013; Mitchell, 1989). Women comprise one of the fastest growing segments of the veteran population, and they are being used increasingly in combat roles despite existing Congressional restrictions. Among the 1.8 million female veterans, more than 230,000 have served in Iraq or Afghanistan. Research suggests that female veterans returning from deployment are more likely than their male counterparts to report mental health concerns such as PTS, depression and suicidal thoughts (Duhart, 2012).

Women are more likely to screen positively for depression both before and after deployments (Koo, 2014). Researchers in 2012 conducted a study of one New Jersey Army National Guard unit before and after a deployment to Iraq. Women were 18% more likely than their male peers to exhibit depression symptoms, and this correlated to lower levels of self-reported unit cohesion (Kline et al., 2013). Women are more likely to face issues of discrimination and belonging, and are at a disproportionately high risk for Military Sexual Trauma (MST). MST is under-studied and under-reported, but between 20-40% of female veterans report experiencing MST during their time in service (Kelly, Skelton, Patel, & Bradley,

2011). The results many report are alienation and decreased feelings of unit cohesion while serving (Levahot, Simpson, Der-Martirosian, Shipherd, & Washington, 2013).

Government understanding of depression and PTS in women is still developing; the Veterans Administration only began providing mental health services to female veterans in 1988. Understanding the role sex plays in depression likelihood is powerfully important and relevant as women's participation in the military is only increasing (Kelly et al., 2011).

Race and Ethnicity

Race and ethnicity in the United States Census, defined by the federal Office of Management and Budget (OMB) and the United States Census Bureau, are self-identification data items in which respondents choose the race or races with which they most closely identify, and indicate whether or not they are of Hispanic or Latino origin, which are the only categories for ethnicity (US Census, 2014). The federal government classifies, tracks, and records race and ethnicity as separate and distinct identities, with Hispanic or Latino origin always asked as a separate question. Thus, in addition to their race or races, all respondents are categorized by membership in one of two ethnic categories, which are "Hispanic or Latino" and "Not Hispanic or Latino". For these reasons, the variables of race and ethnicity are separate, coming out of separate BRFSS questions, but are considered together in this study for purposes of understanding minority status as a predictor of veteran depression. The practice of separating these categories has been critiqued by the United States Commission on Civil Rights; both race and ethnicity are closely linked in studies of health issues for minorities, and must both be considered in any discussion of the topic (Lee & Skrentny, 2010).

In some military-sponsored studies on depression and posttraumatic mental health issues, minority status has not consistently been found to be a significant predictor of the condition

(Coughlin, 2012) or to be a major factor in treatment processes or program outcomes (Rosenhock & Fontana, 2002). However, much like any situation in which a person is subject to the stresses involved with being in a minority position, race and ethnicity may impact the likelihood that a service member develops depression symptoms or feels socially supported in their environment (Murray, 2003).

Research on race, ethnicity, and health disparities has shown interesting results – minority status clearly impacts health outcomes and attitudes towards treatment available (Gomez & Lopez, 2013). The causes of these empirical discrepancies are numerous and complex and involve socioeconomic status, exposure to chronic stress, and social disadvantages that may impair access to health services or that subject minorities to the health risks of disadvantaged environments (Adler & Rehkopf, 2008).

Socioeconomics cannot explain everything; simply moving outside of a given status does not guarantee minorities freedom from health risk (Hudson, et al., 2012). Long-term social stressors associated with discrimination have been shown to lower health outcomes for minorities regardless of neighborhood of residence or financial resources (Blithstein, 2009).

The questions surrounding the impact of minority status on depression rates in veterans merit asking. Currently, the services are diverse, with close to 20% of the active force identifying as minorities (Defense Manpower Data Center, 2010).

Relationship status

Social support is a known contributor to health and longevity, with recent studies indicating that high levels add 7.5 years to the average American lifespan (Egolf, Lasker, Wolf, & Potvin, 1992; Rankin, 2013). A well-known longitudinal study on the effect of social support conducted over a thirty-year period sheds light on the health benefits of close, nurturing

relationships. Researchers studied the inhabitants of a small, insular community of Italian immigrants who lived in nuclear families and interacted with extended family members throughout their lives. Before future generations moved to the suburbs and increased their work hours, divorce rates, and the stress in their lives, rates of heart disease within this community lay exponentially below national averages, though lifestyle behaviors were far from heart-healthy (Greenberg, 1978). This study was named for the community examined, and the Roseto Study began the health field's focus on social cohesion. The primary difference noted among the first and second generation of study participants was the uniquely warm and cohesive community relationships typical in the small town for first generation inhabitants. These relationships had protective health effects for study participants (Seaward, 2004).

While the military is knowledgeable about the importance of unit cohesion in both mission effectiveness and the prevention of stress illness, less attention is often focused on the role of interpersonal social support in the personal lives of service members (Smith, Benight, & Cieslak, 2013). Social relationships play an important role in promoting better health and alleviating diseases. While not all kinds of social interactions produce similar health consequences, intimate partnerships are considered a reliable indicator of social support (Cohen, Underwood, & Gottlieb, 2000; Cutrona, 1996). The ways in which individuals seek and cultivate social support vary widely, but this established, track-able metric has proven useful; both the presence of and supportive behavior within intimate partnerships leads to better physical and mental health outcomes (Cohen et al., 2000). Though the BRFSS is limited to analyzing the simple presence of intimate partnerships and does not ask about the quality of them, it may provide useful information.

Studies have shown that specifically in military settings, high levels of perceived social support independently predict coping self-efficacy post-deployment (Smith et al., 2013).

Behavioral Predictors

Physical activity

Exercise may be more effective than prescription drugs in treating and controlling depression. While most health scientists agree that exercise has a positive effect on physical well-being, exercise appears to be similarly beneficial for mental well-being. Research shows that properly prescribed exercise can positively enhance self-image, elevate mood, improve the ability to cope with stress, increase energy and increase one's feelings of well-being overall (Norris, 2003).

Reports on the effectiveness of exercise therapy on psychological well-being are extensive and show promising results, requiring considerably less cost and time commitment than either drug or psychotherapy. An analysis of 64 studies evaluating the effects of exercise on mental health showed that exercise relieved depression, improved self-esteem and enhanced work behavior (Norris, 2003). Studies using randomized controlled trials find overwhelmingly that exercise can be as effective as medications (Eriksson & Gard, 2011).

Similarly, studies comparing psychotherapy with exercise therapy find, in general, that regular exercise is as effective as psychotherapy in treating depression. A study examining three treatment groups of people with moderate depression yielded interesting validation of this point. The interventions included time-limited psychotherapy, long-term psychotherapy and jogging three times a week for 45 to 60 minutes with a trainer. After 12 weeks, researchers

found that 75% of the people in each group had symptom relief. After a year of exercising, however, those patients who continued to jog had continued relief, whereas those participants in psychotherapy alone had relapsed and returned to treatment (Klein et al., 1984). Qualitative research into the effects of exercise on mental health have shown that the agentic decision to undertake exercise promotes feelings of mastery in participants (Norris, 2003).

Binge drinking/Smoking

Often accompanying a diagnosis of depression in any population are self-medicating behaviors (Shen et al., 2009). Alcohol and drug abuse are associated in the general population with depression symptoms, often used as a “mask” for problems or an escape from reality (Mayo Clinic, 2013). In the military community, risk of both alcohol and drug abuse increases with deployment to a theater of war (Beattie, Battersby, & Pols, 2013; Bossarte, 2013). A major study of 678,382 American military personnel on active duty between 2001-2006 showed statistically significant increases in diagnosed substance abuse disorders among those who had deployed, particularly those who were exposed to combat conditions (Shen et al., 2009).

Destructive alcohol and nicotine use have been linked to a common problem in the veteran community – treatment of chronic pain with opioids (Wachholtz, Ziedonis, & Gonzalez, 2011). Chronic pain is a major problem among veterans returning from Iraq and Afghanistan (Veterans Health Administration, 2011). Pain conditions are the most frequently diagnosed condition in these veterans (Clark, 2004; Spelman et al., 2012). In the United States, pain medications are the most frequently prescribed medications on the market and clinicians express concern about the misuse problems that come along with opioid pain medications (Green, Wheeler, Marchant, LaPorte, & Guerrero, 2001; Turk & Okifuji, 2002). In a survey of physicians working at Veteran’s Administration medical facilities, 40% of clinicians expressed

concern about dependence in patients, and 20% believed that at least half their patients became addicted to prescription pain medications during the course of normal treatment (Dobscha, Corson, Flores, Tansill, & Gerrity, 2008). As chronic pain treatment in the veteran community has increased the use and abuse of prescription medication, so has the use of alcohol and tobacco increased (Joranson, Ryan, Gilson, & Dahl, 2000; Turk & Okifugi, 2002; Mitka, 2003).

Veterans accustomed to medical intervention with substances may continue to self-medicate with legal substances like alcohol and tobacco once formal treatment has ended (Haddock, et al., 2009). A study of 63,397 veteran patients showed that fully 25% demonstrated unhealthy alcohol use patterns. Those with the highest rates of unhealthy alcohol use also had comorbid substance abuse problems (Williams et al., 2014).

Military smoking rates are higher than in the civilian population. One study showed 49% reported using some form of tobacco (smoked tobacco, smokeless tobacco, or both). In the surveyed population of soldiers, smoked tobacco use was 39% while reported smokeless tobacco use was over 19%. (Ornelas, Benne, & Rosencrantz, 2012). In contrast, researchers from the Cancer Intervention and Surveillance Modeling Network report that 20% of adult Americans in the general population now smoke, compared to 50% in 1964 (Sifferlin, 2014).

Physical disability and Pain

Physical disability and impairment that lead to interference with normal activities and functioning are an often-cited problem for veterans seeking treatment with the Veterans Administration (President's Commission on Care for America's Returning Wounded Warriors, 2007). Traumatic Brain Injury and the host of aches, pains, and problems that accompany such a diagnosis have been called a signature injury of the OIF/OEF conflict (Okie, 2005; Tanielan & Jaycox, 2008). An estimated 20% of veterans have sustained Traumatic Brain Injuries, and the

battle injuries that would have killed previous generations are treated today due to body armor improvements (Hoge & Castro, 2012; Warden, 2006). Once a TBI has been sustained, chronic pain is a likely comorbidity, with studies showing between 43-75% of TBI patients also reporting chronic pain (Nampiaparampil, 2008). Explosives common on today's battlefield are often vehicle-borne and high-pressure; current data shows that fully half of the service members who sustain blast injuries also sustain TBIs (Stevenson, 2009). Secondary injuries from blasts result from flying debris and shrapnel, which can lodge in soft tissue and move for years, causing additional injury and pain (Hildreth, 2009).

Disability and physical pain are categorized in this study as behavioral predictors in that disabled condition and pain management are highly-varied and are dependent on lifestyle and health choices made by the veteran and the health professional providing care (Department of Veterans Affairs, 2014). For example, quality physical therapy and the use of athletic prosthetics to engage in adaptive wellness behaviors are linked to recovery in disabled veterans, as are non-traditional pain management treatment protocols like acupuncture (Stoneman, Hooper, & Scoville, 2014; Williams, 2013). In contrast, the use of opioids to manage pain is strongly correlated with depression and suicide (Coughlin, 2012; Wachholtz, Ziedonis, & Gonzalez, 2011).

A cross-sectional study of 884 VA patients at 4 hospital sites found that physical pain and disability often accompanied mental health diagnoses. Approximately 9.4% of diagnosed patients expressed suicidal ideations, but researchers found that pain and physical disability were not correlated with such ideations (Magruder, Yeager, & Brawman-Mintzer, 2012). The relationship between physical disability and mental health is unclear, but was explored in this study as a possible predictor of depression.

Beliefs about mental health care

The issue of stigma against patient-identity and mental health treatment has been explored in this literature review. The question of whether or not a veteran believes mental health care can be effective may provide more insight into the stigma conundrum.

A study published in 2013 in the *American Journal of Public Health* highlights a relevant secondary analysis of BRFSS data from 2007 working to look at demographic differences and mental health care attitudes. Researchers found that respondents who had received professional diagnoses were more likely to agree that mental health care was effective. A smaller number of non-diagnosed respondents agreed that it was effective (Kobau et al., 2011). Simply put, contact with the existing care system impacts opinions, and veterans with symptoms indicating undiagnosed depression may suffer from negative beliefs about mental health care in general.

Analyzing this question within the veteran community may provide additional information and guide programming around issues of beliefs and exposure. Reviewing Resiliency Theory proves useful when considering the variable of stigma about mental health care, which an overview of warrior culture indicates may be a widespread problem in the veteran community (Lee, et al., 2013).

CHAPTER 3

METHODOLOGY

The purpose of this study was to examine the relationship between ten key variables and rates of diagnosed depression and symptoms indicating undiagnosed depression in a national sample of veterans to generate predictive models for the condition in military veterans.

Logistical regression analysis explored linkages between two depression variables in veteran respondents, predicted by veteran era, sex, ethnicity, race, relationship status, physical activity, alcohol usage, smoking, physical disability, and beliefs about mental health care. The results offer insight into understanding the complex issue of depression in American veterans and predictive models for diagnosed depression and the key symptoms that indicate undiagnosed depression.

Approval from Institutional Review Board

The study was submitted to the Institutional Review Board of the University of Alabama for review. Because the analysis was secondary in nature and did not involve contact with human subjects, this study was granted exemption from the review process by the Institutional Review Board of the University of Alabama.

Quantitative Methods - Survey Instrument

The Behavioral Risk Factor Surveillance Survey (BRFSS) conducted by the Centers for Disease Control and Prevention (CDC) is an annual survey delivered across the country by state health departments. It is based upon a current, national, and random sample of respondents from across the country. In addition to all 50 states, the BRFSS is also conducted by health departments in The District of Columbia, Guam, Puerto Rico, and the U.S. Virgin Islands. The BRFSS inquires about a number of demographic, health, and behavioral issues and provides comprehensive analysis opportunities for a broad range of health topics. The survey consists of a main document and optional modules, and is delivered telephonically by trained personnel affiliated with state and local health departments (Centers for Disease Control and Prevention, 2014).

Data Management

Data are publically available on the CDC website. All data download and secondary analysis was conducted using the Statistical package for the Social Sciences version 21 for Windows (SPSS Inc., 2013). Electronic data files were stored on two removable drives that were stored in a secured office on the University of Alabama campus.

Coding Variables

In order to explore the research questions of this study, data from veteran respondents was split from the BRFSS survey at large. The resulting respondent pool included a large, nationally-sourced sample of 54,060 veterans, of whom 8.5% were women. This percentage closely aligns with national estimates that women comprise 10% of the American veteran population (Defense Manpower Center, 2012). According to figures from the latest American Community Survey, the U.S. veteran population is 85% white, 10.3% African American, and 1.3 percent Asian American or Pacific Islander (US Census, 2014). The sampled veterans in the 2012 BRFSS were 92.6% white and 7.4% African American. To simplify analysis, only the largest racial minority groups (white and African American) were included. Classified as an ethnicity rather than a race, 5.1% of veterans identify as Hispanic (US Census, 2014). The BRFSS sample group is slightly limited, under-representing at 2.7% Hispanic.

Outcome/Dependent Variables

Diagnosed Depression

To analyze the research questions seeking correlation between veteran depression and predictor variables required culling and recoding key variables indicating depression symptoms.

A BRFSS question asking specifically whether a respondent had ever been diagnosed with depression was recoded to eliminate responses that either refused to answer or did not know the answer. This provided an outcome variable indicating medically-diagnosed depression. The BRFSS survey includes as “yes” responses diagnoses of varying severities, including mild, moderate, and major. While depression levels are somewhat subjectively and situationally-

diagnosed, guidelines related to symptom persistence and duration exist. Mild depression manifests as feelings of nervousness, hopelessness, restlessness, depression, low interest in activities, and/or worthlessness for a short period of time. Mild depression is the most easily-treated category, and the most frequently undiagnosed (Mayo Clinic, 2013). The Diagnostic and Statistical Manual, 5th edition classifies as mild depression symptom displays for 5-9 days (DSM-V, 2013) in symptom severity measurements (DSM V, 2013). Moderate depression is classified as symptom displays for 10-14 days by the adult depression severity measure recommended by the DSM-V, which is adapted from the Patient Health Questionnaire-9 (DSM V, 2013). Major depression is characterized by symptom displays for 15 or more days by the adult depression severity measure; major depression is the most serious form of depression (DSM-V, 2013). This study's diagnosed depression variable includes all three severity levels in diagnoses category because the BRFSS survey question includes all levels in question 5.10.

Question 5.10 specifically asks about chronic health conditions and asks, "Have you ever been told you have a depressive disorder, including depression, major depression, dysthymia, or minor depression?" This categorical variable was recoded to eliminate non-responses, leaving only yes and no respondents, $n = 54,060$.

Symptoms Indicating Undiagnosed Depression

In order to broaden the utility of models in this analysis, this study sought indicators of depression that could be coded to indicate undiagnosed cases of depression in respondents. A thorough literature review indicated that those variables include both the frequency of depression symptoms and the presence of feelings like nervousness, hopelessness, restlessness, depression, low interest in normal activities, and/or feelings of worthlessness as well as the severity of perceived poor mental health (DSM V, 2013). Depression symptoms are varied and present

themselves differently in each individual, so perception of overall poor mental health may be a useful indication of undiagnosed depression (Mayo Clinic, 2013). A question in the 2012 BRFSS addresses symptom presence and offered enough responses to present statistically useful possibilities. This continuous variable was recoded to eliminate respondents who were already medically-diagnosed with a depressive condition. Respondents were coded as “yes” included those who indicated by answering a key question whether undiagnosed depression of any severity may be present. Question 2.2 specifically asks, “thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?” Patients discussing symptoms for 5-9 days would be classified as mild, 10-14 as moderate, and 15-30 as major (DSM V, 2013). For purposes of this analysis, self-reported symptom presence anywhere from 5-30 days was coded to indicate likely undiagnosed depression. This invited comparability with the variable indicating diagnosed depression, which also grouped severity levels together. Previously-diagnosed respondents and non-responses were dropped to simplify analysis, leaving $n = 45,987$.

Predictor/Independent Variables

Predictor variables were recoded as necessary to offer insight into the subject of veteran depression. They are categorized into two types, demographic and behavioral.

Demographic Predictors

Demographic predictors lend unique insight and may improve program targeting in the future. These include: veteran era, sex, ethnicity, race, and relationship status.

The CDC’s 2012 Behavioral Risk Factors Surveillance Survey (BRFSS) asks specific questions about respondents’ age and collects the data in continuous fashion. For purposes of

this analysis, this data proved useful in creating a predictor variable that reflects the era from which the veteran respondent hails. The 2012 BRFSS asks specifically in question 7.1 “What is your age?” This continuous variable of age was recoded according to ranges provided by the Bureau of Labor Statistics to indicate veteran era, which indicates not just age but conflict era and the type of government mental health resources and outreach available to that generation of veterans. Veterans are grouped into service eras according to their age in Bureau of Labor Statistics tabulations, because Department of Defense manpower numbers indicate that most service members fall within a given demographic age range. 72% of service members are 18-30 years old (Defense Manpower Data Center, 2012). Recoding age involved taking the BRFSS continuous age variable and assigning it to categories. Veterans serving in the most recent conflicts in Iraq and Afghanistan are those between the ages of 18-34, and were be coded OIF/OEF. Respondents between the ages of 35-55 were assigned the Gulf War era category, and veteran respondents over 55 to the Vietnam/Korean Era (Bureau of Labor Statistics, 2013). To further break out the variable and differentiate between veterans of Vietnam and Korea, an additional category to those used by the Bureau of Labor was added. Veterans 55-70 were assigned to the Vietnam era, and over 70 to Korea. Veterans’ experiences in a given era are colored by the conflict that dominated their time in service and the government resources and policies prevalent during service and the transitory period immediately after leaving. (Bureau of Labor Statistics, 2013). All respondents answered the age question and the resulting $n = 54,060$.

The key variable of sex was identified by asking in question 7.20, “what is your sex?” and all respondents answered the question, resulting $n = 54,060$.

Race and ethnicity in the United States Census, defined by the federal Office of Management and Budget (OMB) and the United States Census Bureau, are self-identification data items in which residents choose the race or races with which they most closely identify, and indicate whether or not they are of Hispanic or Latino origin, which are the only categories for ethnicity (US Census, 2014). The federal government classifies, tracks, and records race and ethnicity as separate and distinct identities, with Hispanic or Latino origin always asked as a separate question. Thus, in addition to their race or races, all respondents are categorized by membership in one of two ethnic categories, which are "Hispanic or Latino" and "Not Hispanic or Latino". For these reasons, the variables of race and ethnicity are separate variables coming out of separate BRFSS questions, but were considered together in this study for purposes of understanding the impact of minority status as a predictor of veteran depression. The practice of separating these categories has been critiqued by the US Commission on Civil Rights; race and ethnicity are closely linked in studies of health issues for minorities, and must both be considered in any discussion of the topic (Lee & Skrentny, 2010). Question 7.2 asks specifically, "Are you Hispanic or Latino," and respondents could indicate yes, no, don't know, or refuse to answer. Recoding the variable involved simplification to drop non-responses who didn't know their ethnicity or refused to answer the question. The resulting $n = 53,882$.

Race was also recoded for category simplification. Respondents on the 2012 BRFSS survey could indicate membership in only one racial group or check several. The 2012 BRFSS inquires about race in question 7.3, which asks specifically, "which or more of the following would you say is your race?" Optional answers include the following categories: white, black or African American, Asian, Native American or Pacific Islander, American Indian or Alaskan Native, or other. Because initial frequencies were so small for all groups besides White and

African-American, the variable was recoded to simplify analysis and included only those two categories. Research precedent for such simplification exists in health studies of minority veterans (Ghafoori & Hierholzer, 2010; Williams, Bradley, & Gupta, 2012). Respondents who answered that they did not know or who refused to answer were dropped to simplify categorization; the resulting $n = 53,122$.

A BRFSS question asking about marital status and partner relationships provided insight into the social support a respondent enjoys. Veteran respondents in the 2012 BRFSS survey answered demographic questions about the status of their personal relationships. Social relationships play an important role in promoting better health and alleviating diseases (Rankin, 2013). While not all kinds of social interactions produce similar health consequences, intimate partnerships are considered a reliable indicator of social support (Cohen, Underwood, & Gottlieb, 2000; Cutrona, 1996). Question 7.6 asks participants if they are in a partnership with their options to reply including: married, divorced, widowed, separated, never married, or a member of a non-married couple. Some had close partnerships while others did not, making possible analysis of relationship status (which indicates social support) as a predictor of veteran depression. Recoding the variable to account for partnership existence involved categorizing respondents based on their intimate partner relationship status. Participants in a relationship were classified as those who identified as married or members of a non-married domestic partnership. Divorced, widowed, and unmarried respondents were classified as not in intimate partner relationships. All veteran respondents answered the relationship status question and the resulting $n = 54,060$.

Behavioral Predictors

Associations of behavioral predictors like physical inactivity, binge drinking, physical disability, smoking, and beliefs about mental health care shed light on the outcome variables of diagnosed and symptoms indicating undiagnosed depression in veterans. Recoding variables to drop non-responses and simplify categories rendered secondary analysis more useful.

Physical activity is indicated in veteran respondents to the BRFSS in question 4.1, which asks specifically, “during the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?” Respondents indicated a simple yes or no response to this physical activity question, and all respondents answered the activity question, providing a result of $n = 54,060$.

BRFSS respondents answered questions about their drinking and smoking behaviors that provided limited insight into whether habits like smoking and binge drinking can predict depression. The statistical usefulness of these variables was limited by the number of respondents who did not recall or refused to answer the questions about their usage, but data were present in sufficient numbers to render analysis possible. Initial frequencies showed 46.1% of the data missing for the binge drinking variable ($n = 29,152$) and 37.5% missing for smoking ($n = 33,767$). Oftentimes, missing data encountered in survey research are imputed by relying on statistical methods. Coordinated by the Centers for Disease Control and Prevention, Behavioral Risk Factors Surveillance System (BRFSS) is the world’s largest random digit dialing survey. However, since its inception some 20 years ago, missing data for BRFSS have not been. Analogous to other large surveys, BRFSS encounters nonresponse at both unit and item levels (Fahimi, 2007).

Since alcohol use in binge drinking fashion is considered unhealthy, the variable of alcohol use was categorized to include those who identified as heavy users (binge drinkers) and those whose use fell under daily guidelines (Stappenbeck, Hellmuth, Simpson, & Jakupcak, 2014). Male users who drank 5 or more per day and female users who drank 4 or more per day were categorized as binge drinkers. In question 10.3, veteran respondents were asked how many days in the past month they had consumed 4/5 or more beverages in a single occasion. The interviewer phrased the question as 4 for female respondents and 5 for male respondents, synchronizing the data as they were collected. Respondents who reported doing this one or more times in a month were categorized as binge drinkers, while those who did not report exceeding that number of drinks in one sitting were categorized as non-binge drinkers.

Question 9.2 asks participants specifically if they smoke cigarettes every day, some days, or not at all. Smokers included those who admitted to cigarette usage, specifically using cigarettes every day or some days. Non-smokers identified as never using them.

A variable addressing the issue of pain and physical disability required little recoding. Question 8.1 in BRFSS asks whether respondents are “limited in any way because of physical problems,” with respondents indicating yes or no. Non-responses were dropped to simplify secondary analysis, and the resulting $n = 53,567$.

Of particular interest was a question asking respondents to offer opinions on the usefulness of seeking mental health care. This question sheds light on issues of patient-stigma in the veteran population, which is not currently well-understood (Malmin, 2013). The BRFSS assesses respondents’ attitudes about the effectiveness of mental health care, asking specifically in question 9 of Module 17 whether the respondent believes such care can be positive and helpful. It asks respondents to agree on a scale (agree strongly, agree slightly, neither agree nor

disagree, disagree slightly, or disagree strongly) with the statement “treatment can help people with mental illness lead normal lives.” To simplify the categories for analysis, the variable was recoded to include all respondents answering agree strongly or slightly as ‘yes’ responses, all disagreeing slightly or strongly, or neutrally as ‘no’ responses. Because all respondents answered in one of these ways, the resulting $n = 54,060$.

Data Analysis

Running preliminary frequencies highlighted the viability of this study’s secondary analysis of 54,060 veteran respondents.

Descriptive statistics were generated on all study variables. To provide macro-level practical significance information, crosstab analysis checked for the practical significance and strength of the effect of independent variables on dependent variables (Hosmer & Lemeshow, 2000). Correlations resulting from univariate logistic regression analysis then screened the effect of these independent variables (veteran era, sex, ethnicity, race, relationship status, physical inactivity, alcohol usage, smoking, physical disability, and beliefs about mental health care) on dependent variables including: diagnosed depression and symptoms indicating undiagnosed depression. Significance levels were set *a priori* at $p < .05$; variables displaying significance in univariate analysis were tested in a multivariable regression model (Chatterjee & Siminoff, 2013; Young, Turner, Denny, & Young, 2004).

Multivariate regression analysis proceeded with stepwise logistic regression analysis to seek predictive models for the data sample (Field, 2005). Independent variables with p values < 0.05 in the full model analysis were tested at the 0.05 level in a multivariable regression reduced

model (Chatterjee & Siminoff, 2013). Independent variables were analyzed for collinearity and a large regression coefficient using Nagelkerke's R^2 test (Field, 2005; Hosmer, Lemshow, & Sturdivant, 2013).

Important methods for determining if a full model can be reduced to a smaller number of variables without losing predictive power of the full model exist (Hosmer & Lemeshow, 2000; Young, Turner, Denny, & Young, 2004). The second reduced model analysis involved selectively running multivariate logistic regression analysis including only variables with larger odds ratios, then checking to ensure the viability of the newly-created model. To assess if difference existed in the predictive value between the full and reduced models, the beta of each independent variable in the reduced model was subtracted from the beta in the full model. A difference of less than 20 percent was considered acceptable (Field, 2005). Independent variables in the selectively-reduced model were analyzed for collinearity and a large regression coefficient using Nagelkerke's R^2 test (Field, 2005; Hosmer, Lemshow, & Sturdivant, 2013).

CHAPTER 4

RESULTS

A number of studies have attempted to explore the issue of depression in veterans, but ranges and rates vary widely and predictive models that could guide programming are lacking (Girona, Clark, Massengale, & Walker, 2006; Seal et al., 2009; Tanielian & Jaycox, 2008). The purpose of this study was to examine the relationship between ten key variables and rates of diagnosed depression and symptoms of undiagnosed depression in a national sample of veterans to generate predictive models for the condition in military veterans.

To explore this complex subject, the present study examined correlations between predictive variables and diagnosed depression as well as one variable indicating the presence of important symptoms of undiagnosed depression. Logistic regression analysis was used to explore linkages between diagnosed and symptoms indicating undiagnosed depression in veteran respondents and predictor variables that included: veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability, and beliefs about mental health care usefulness. By examining professionally-diagnosed depression and symptoms of depression that indicate depressive conditions never medically-diagnosed, the study was designed to add to available information on the complex issue of veteran mental wellness.

Chapter four delineates and tabulates the findings of the investigation. All data were publically available and analyzed using the Statistical package for the Social Sciences version 21 for Windows (SPSS Inc., 2013). Descriptive statistics described the characteristics of the sample, and a Little's Test was run on the predictor variables of binge drinking and smoking to

explain missing data. Univariate logistic regression analysis evaluated the significance of ten predictor variables towards undiagnosed and diagnosed depression. The *a priori* criteria indicating significance level to enter a predictor into the model was less than or equal to .05. Multivariate regression analysis from the full model proceeded with stepwise regression, with independent variables with *p* values < 0.05 in the full model analysis tested in reduced model (Chatterjee & Siminoff, 2013). Independent variables were analyzed for collinearity and large regression coefficients using Nagelkerke's R^2 test (Field, 2005; Hosmer, Lemshow, & Sturdivant, 2013).

The second reduced model analysis involved selectively running multivariate logistic regression analysis including only variables with larger odds ratios, then checking to ensure the viability of the newly-created model. To assess if differences existed in the predictive value between the full and reduced models, the beta of each independent variable in the reduced model was subtracted from the beta in the full model. A difference of less than 20 percent was considered acceptable (Field, 2005). Independent variables in the selectively-reduced model were analyzed for collinearity and a large regression coefficient using Nagelkerke's R^2 test (Field, 2005; Hosmer, Lemshow, & Sturdivant, 2013).

Data Source

A sample of 54,060 veteran respondents from the 2012 Behavioral Risk Factor Surveillance Survey (BRFSS) conducted by the Centers for Disease Control (CDC) was analyzed in this study. The study was delimited to participants who responded to questions about veteran era, sex, ethnicity, race, relationship status, physical inactivity, binge drinking,

smoking, physical disability, and beliefs about mental health care, and on rates of self-reported and diagnosed depression in veterans. The analyzed sample included non-institutionalized veterans who were surveyed during the national BRFSS phone canvass process.

Sample Characteristics

The resulting respondent pool was a large, nationally-sourced sample of 54,060 veterans. Veteran era provided important information about both age and conflict era; 6% of respondents were from the OIF/OEF era, 18.3% from the Gulf War, 39.5% from Vietnam, and 36.2% from Korea. In the veteran sample, 8.5% of respondents were women. Veterans in the sample reported ethnicity at 2.7% Hispanic; racial demographics in sampled veterans from the 2012 BRFSS were 92.2% white and 7.8% African American. Relationship status in the sampled population indicated that 62.9% were in a committed partnership such as a marriage or cohabiting, serious relationship, while 37.1% were divorced, widowed, or single. Table 4.1 highlights the demographic characteristics of the veteran sample.

Table 4.1

Summary of Demographic Frequency Statistics for Sample of Veteran Respondents

Variable	<i>n</i>	%
Sex	54060	
Female	4544	8.4%
Male	49516	91.6%
Veteran Era	54060	
Operations Iraqi/Enduring Freedom	3528	6.0%
Gulf	9887	18.3%
Vietnam	21366	39.5%
Korea	19549	36.2%
Race	53122	
White	48997	92.2%
Black	4125	7.8%
Ethnicity	53882	
Hispanic	1541	2.9%
Non-Hispanic	52341	96.8%
Relationship Status	54060	
Partnership	34006	62.9%
No partnership	20054	37.1%

Table 4.2 presents additional characteristics of the study sample, which were also dependent variables in the regression analyses. Of the nationally-sourced sample of 54,060 veterans, 14.9% reported a medically-diagnosed depression condition of mild, moderate, or major severity. Of veterans in the sample who did not already have a depression diagnosis, 7.7% indicated the presence of symptoms that indicate undiagnosed depression of mild, moderate, or major severity.

Also in Table 4.2 are characteristics of the study sample which were also independent variables in the regression analyses. Physical movement practices in the sample of veterans analyzed showed that 75.4% of respondents had engaged in activities such as running, calisthenics, golf, gardening, or walking for exercise in the previous month. Respondents who had not done so included the 24.6% who reported being completely physically inactive. Smoking and drinking rates in the veteran sample indicated that 25% were smokers and 22.1% had engaged in binge drinking behaviors in the past month. Almost thirty percent (29.7%) reported physical disability and chronic pain, and 2.2% held a favorable view of mental health treatment and its usefulness for an individual in mental health distress.

Table 4.2

Frequency Statistics for Sample of Veteran Respondents

Variable	<i>n</i>	%
Diagnosed Depression	54060	
Yes	8073	14.9%
No	45987	85.1%
Symptoms of Undiagnosed Depression	45987	
Yes	3534	7.7%
No	42453	92.3%
Physical Activity	54060	
Yes	40761	75.4%
No	13299	24.6%
Smoking	33767	
Yes	8448	25.0%
No	25319	75.0%
Binge Drinking	24908	
Yes	6437	22.1%
No	22715	77.9%
Disability & Pain	53567	
Yes	15916	29.7%
No	37651	69.6%
Beliefs About Mental Health Care	54060	
Favorable	1169	2.2%
Unfavorable	52891	97.8%

Data Analyses

Missing Data

Missing data typically create an underrepresentation issue that researchers must be mindful of in terms of variable limitation (Fahimi, 2007; Schneider, Clark, Rakowski, & Lapane, 2012). BRFSS respondents answered questions about their drinking and smoking behaviors that provided limited insight into whether habits like smoking and binge drinking can predict depression. The statistical usefulness of these variables was limited by the number of respondents who did not recall or refused to answer the questions about their usage, but data were present in sufficient numbers to render analysis possible. Initial frequencies showed 46.1% of the data were missing for the binge drinking variable ($n = 29,152$) and 37.5% were missing for smoking ($n = 33,767$).

While a basic weighting methodology has been developed and standardized to compensate for some of the bias resulting from differential nonresponse at the unit level, currently, there are no procedures in place to impute missing data for BRFSS (Fahimi, 2007). BRFSS data does not have a standardized or recommended imputation method due to weighting procedures utilized during data collection (Schneider, et al., 2012). Statistical experts disagree on the subject of data imputation for missing values. Using list-wise deletion to eliminate non-responses, participants with missing values on a variable can be omitted from analysis. Though this reduces power and introduces some level of bias, it does not create imputation bias risks (Fahimi, 2007).

Imputation has not been shown to be effective using BRFSS data in research conducted to check for the reliability of item level imputation methods (Schneider, Clark, Rakowski, & Lapane, 2012). Some studies found no difference between results using imputed data for key variables and the same analysis using list-wise deletion (Jiang & Hesser, 2011). Research specifically looking at underrepresentation issues on BRFSS self-reported depression and anxiety indicators found that list-wise deletion and demographic imputation resulted in similar underestimate percentages of 7-9% (Frankel, Battaglia, Balluz, & Strine, 2012). Standard methods for item imputation fall short of maximum possible bias reduction (Frankel, et al., 2012).

The present study relied on list-wise deletion for the variables of smoking and binge drinking, as resulting sample sizes were still sufficient for statistical analysis.

Crosstabs and Effect Size Analysis

The independent variables were tested and crosstab modeling demonstrated the following:

1. Diagnosed depression was significantly related to all predictor variables including: veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability, and beliefs about mental health care usefulness using a threshold of $p < .05$.
2. The variable coded to show symptoms indicating undiagnosed depression was significantly related to the variables of veteran era, sex, ethnicity, race, relationship

status, physical activity, binge drinking, smoking, and physical disability using a threshold of $p < .05$.

3. For the outcome variable of diagnosed depression, predictor variables that were both statistically significant and important to the individual in terms of effect (odds ratios of 1.5 or higher) included: sex, relationship status, activity, smoking, disability & pain, and opinions about mental health care treatment.
4. For the outcome variable highlighting symptoms indicating undiagnosed depression, predictor variables that were both statistically significant and important to the individual in terms of effect (odds ratios of 1.5 or higher) included: sex, ethnicity, smoking, binge drinking, and disability & pain.

Table 4.3

Univariate Logistic Regression Analysis of Predictor Variables: Diagnosed Depression

Variable	<i>p</i>	Odds Ratio	95% CI	Nagelkerke
Veteran Era (likelihood of 'yes' diagnosis)	< .01	n/a		2.3%
Operations Iraqi/Enduring Freedom (15.7%) * <i>Odds ratios from univariate regression with smallest category as reference</i>	< .01	1.748 (1.572, 1.941)		
Gulf (18.8%)	< .01	2.164 (2.020, 2.320)		
Vietnam (17.8%)	< .01	2.02 (1.912, 2.150)		
Korea (9.7%)				
Sex	< .01	2.109 (1.965, 2.268)		1.2%
Female likelihood of 'yes' diagnosis = 25.5%				
Male likelihood of 'yes' diagnosis = 14.0%				
Race	< .01	1.199 (1.102, 1.103)		0.1%
Likelihood of 'yes' diagnosis for Af-Am = 17.3%				
Likelihood of 'yes' diagnosis for Whites = 14.8%				
Ethnicity	< .01	1.212 (1.060, 1.385)		0.0%
Likelihood of 'yes' diagnosis for Hispanic = 17.5%				
Likelihood of 'yes' diagnosis for Non-Hispanic = 14.9%				
Relationship Status	< .01	1.653 (1.575, 1.733)		1.4%
Likelihood of 'yes' diagnosis for Non-Partnered = 19.1%				
Likelihood of 'yes' diagnosis for Partnerships = 12.5%				

Activity	< .01	1.808(1.718, 1.901)	1.6%
Likelihood of 'yes' diagnosis for Inactive = 21.1%			
Likelihood of 'yes' diagnosis for Active = 12.9%			
Smoking	< .01	2.027(1.907, 2.154)	2.5%
Likelihood of 'yes' diagnosis for Smokers = 24.9%			
Likelihood of 'yes' diagnosis for Non-smokers = 14.0%			
Binge Drinking	< .01	1.424(1.318, 1.539)	0.5%
Likelihood of 'yes' diagnosis for binge drinkers = 16.2%			
Likelihood of 'yes' diagnosis for Non = 11.9%			
Disability & Pain	< .01	4.421(4.208, 4.645)	1.1%
Likelihood of 'yes' diagnosis for Disabled = 29.7%			
Likelihood of 'yes' diagnosis for Non = 8.7%			
Beliefs About Mental Health Treatment	< .01	23.876(1.703, 27.536)	7.8%
Likelihood of 'yes' diagnosis for Favorable = 78.9%			
Likelihood of 'yes' diagnosis for Non = 13.5%			

Table 4.4

Univariate Logistic Regression Analysis of Predictor Variables: Symptoms Indicating Undiagnosed Depression

Variable	<i>p</i>	Odds Ratio	95% CI	Nagelkerke
Veteran Era (likelihood of undiagnosed depression presence)	< .01	n/a		3.5%
Operations Iraqi/Enduring Freedom (20.5) * <i>Odds ratios from univariate regression with smallest category as reference (Korea)</i>	< .01	4.209	(3.762, 4.709)	
Gulf (10.6%)	< .01	1.934	(1.758, 2.127)	
Vietnam (6.3%)	< .01	1.098	(1.006, 1.199)	
Korea (5.8%)				
Sex	< .01	1.720	(1.541, 1.920)	5.8%
Female likelihood of undiagnosed depression presence = 12.0%				
Male likelihood of undiagnosed depression presence = 7.3%				
Race	< .01	1.381	(1.228, 1.554)	0.1%
Likelihood of undiagnosed depression presence for Af-Am = 10.0%				
Likelihood of undiagnosed depression presence for Whites = 7.5%				
Ethnicity	< .01	3.448	(3.003, 3.968)	5.8%
Likelihood of undiagnosed depression presence for Hispanic = 21.3%				
Likelihood of undiagnosed depression presence for Whites = 7.3%				
Relationship Status	< .01	1.323	(1.234, 1.419)	0.3%
Likelihood of undiagnosed depression presence for Non-Partnered = 9.0%				
Likelihood of undiagnosed depression presence for Partnered = 7.0%				

Activity	< .01	1.190	(1.100, 1.064)	0.1%
Likelihood of undiagnosed depression presence for inactive = 8.7%				
Likelihood of undiagnosed depression presence for Whites = 7.4%				
Smoking	< .01	1.712	(1.552, 1.890)	1.0%
Likelihood of undiagnosed depression presence for Smokers = 10.3%				
Likelihood of undiagnosed depression presence for Non-smokers = 6.3%				
Binge Drinking	< .01	2.141	(1.930, 2.370)	1.9%
Likelihood of undiagnosed depression presence for binge drinkers = 11.5%				
Likelihood of undiagnosed depression presence for Non - 5.7%				
Disability & Pain	< .01	1.718	(1.595, 1.852)	1.0%
Likelihood of undiagnosed depression presence for Disabled = 10.6%				
Likelihood of undiagnosed depression presence for Non= 6.4%				
Beliefs About Mental Health Treatment	.629	1.117	(.713, 1.748)	0.0%
Likelihood of undiagnosed depression presence for Favorable = 8.5%				
Likelihood of undiagnosed depression presence for Non = 7.7%				

Regression Analysis

Univariable logistic regression analysis demonstrated the following:

1. Seeking significance with p values < 0.05 , all predictor variables of veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability, and beliefs about mental health care usefulness were of significance to the outcome variable of diagnosed depression.
2. Seeking significance with p values < 0.05 , predictor variables of veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, and physical disability were of significance to the outcome variable symptoms indicating undiagnosed depression.
3. With an alpha level greater than .05, the variable highlighting opinions on mental health treatment usefulness was excluded from the full model logistic regression analysis for undiagnosed depression (Table 4.3). This variable excluded from the full model was retested in the reduced model and lacked significance.
4. The percent of variance explained by each variable was small, though significance existed between most independent variables and the two dependent variables of diagnosed depression and symptoms indicating undiagnosed depression.

Multivariable Logistic Regression Analysis – Stepwise Reduced Models

The ten predictor variables of veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability, and beliefs about mental health

care usefulness were tested in the full model for the outcome variable of diagnosed depression.

Using the selection criteria of $p < .05$ the variables of race, ethnicity, and binge drinking were excluded from the full model, lacking significance when re-tested in the reduced model.

Adequate model fit was indicated by predicted percentages, with the full model predicting the outcome variable of diagnosed depression correctly 87.3% of the time. Nagelkerke's R^2 test indicated adequate model fit and showed that interaction and collinearity of the predictor variables were absent, with 20% of the variance explained by the full model.

Table 4.5

Full Model Stepwise Logistic Regression: Diagnosed Depression

					95% C.I.for EXP(B)	
Variable	B	S.E.	Sig.	Exp(B)	Lower	Upper
Veteran Era (Korea as reference category)						
Operations Iraqi/Enduring Freedom	-0.996	.099	p < .01	2.710	2.232	3.290
Gulf	-0.868	.075	p < .01	2.380	2.058	2.755
Vietnam	-0.720	.060	p < .01	2.053	1.821	2.309
Sex	0.678	.080	p < .01	1.970	1.683	2.305
Relationship Status	0.376	.048	p < .01	1.456	1.326	2.305
Activity	0.247	.053	p < .01	1.280	1.153	1.421
Smoking	-0.331	0.053	p < .01	1.392	1.254	1.546
Disability/Pain	-1.298	.048	p < .01	3.663	3.333	4.016
Treatment Opinions	-2.956	.135	p < .01	23.809	14.706	25.000

Table 4.6

Excluded Variables in Stepwise Logistic Regression: Diagnosed Depression

Excluded Variable	Sig.
Race	.825
Ethnicity	.075
Binge Drinking	.171

The variables of veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, and physical disability were tested in the full model for the outcome variable of symptoms indicating undiagnosed depression. Using the selection criteria of $p < .05$ the variables of activity and race were excluded from the full model, lacking significance when re-tested in the reduced model. Adequate model fit was indicated by predicted percentages, with the full model predicting the outcome variable, symptoms indicating undiagnosed depression correctly 93.2% of the time. Nagelkerke's R^2 test indicated adequate model fit and showed that interaction and collinearity of the predictor variables were absent, with 8.2% of the variance explained by the full model.

Table 4.7

Full Model Stepwise Logistic Regression: Symptoms Indicating Undiagnosed Depression

Variable	<i>B</i>	S.E.	Sig.	Exp(B)	95% C.I.for EXP(B)	
					Lower	Upper
Veteran Era (Korea as reference category)						
Operations Iraqi/Enduring Freedom	1.574	.117	p < .01	4.828	3.841	6.069
Gulf	0.880	.101	p < .01	2.412	1.979	2.939
Vietnam	0.206	.088	0.019	1.229	1.034	1.460
Sex	-0.301	.120	.012	1.351	1.067	1.709
Ethnicity	0.779	.151	p < .01	2.180	1.622	2.932
Relationship Status	-0.226	.068	0.001	1.253	1.098	1.431
Binge drinking	0.338	.073	p < .01	1.402	1.214	1.619
Smoking	0.276	.074	p < .01	1.317	1.139	1.523
Disability/Pain	.627	.072	p < .01	1.872	1.626	2.156

Table 4.8

Excluded Variables in Stepwise Logistic Regression: Symptoms Indicating Undiagnosed Depression

Excluded Variable	Sig.
Activity	.110
Race	.074

Multivariable Logistic Regression Analysis – Selectively Reduced Model

Important methods for determining if a full model can be reduced to a smaller number of variables without losing predictive power of the full model exist (Hosmer & Lemeshow, 2000; Young, Turner, Denny, & Young, 2004). To further hone the predictive model, selective reduction involved running multivariate logistic regression analysis including only independent variables with odds ratios indicating practical significance, including variables with odds ratios greater than 1.5 in multivariate analysis, then checking to ensure the viability of the newly-created model. For the outcome variable of diagnosed depression, predictor variables that were both statistically significant and important to the individual in terms of effect (odds ratios of 1.5 or higher) included: sex, disability & pain, and opinions about mental health care treatment. For the outcome variable of symptoms indicating undiagnosed depression, predictor variables that were both statistically significant and important to the individual in terms of effect (odds ratios of 1.5 or higher) included: ethnicity and disability/pain.

At an alpha level = .05 the variables of sex, disability, and beliefs about mental health care usefulness were associated with diagnosed depression. Adequate model fit was indicated by

predicted percentages, with the model predicting the outcome variable of symptoms indicating undiagnosed depression correctly 86.3% of the time. Nagelkerke's R^2 test indicated that interaction and collinearity of the predictor variables were absent, with 18.3% of the variance explained by the selectively-reduced model. Beta differences between independent variables in the full stepwise and selectively-reduced models were acceptable at below 20% (Field, 2005; Hosmer & Lemeshow, 2000; Young, Turner, Denny, & Young, 2004).

Table 4.9

Selectively-Reduced Model Logistic Regression: Diagnosed Depression

Variable	<i>B Difference</i>	<i>B</i>	<i>S.E.</i>	<i>Sig.</i>	<i>Exp(B)</i>	95% C.I. for EXP(B)	
						Lower	Upper
Sex	0.090	0.772	.040	$p < .01$	2.165	2.002	2.341
Disability/Pain	.156	-1.454	.026	$p < .01$	4.274	4.065	4.505
Beliefs on Treatment	.035	-2.991	.076	$p < .01$	20.000	17.241	23.256

At an alpha level = .05 the variables of ethnicity and disability were associated with symptoms indicating undiagnosed depression. Adequate model fit was indicated by predicted percentages, with the model predicting the outcome variable of symptoms indicating undiagnosed depression correctly 92.6% of the time. Nagelkerke's R^2 test indicated that interaction and collinearity of the predictor variables were absent, with 2.5% of the variance explained by the full model. Beta differences between independent variables in the full stepwise and selectively-reduced models were acceptable only for disability/pain, rendering the selectively-reduced model for symptoms indicating undiagnosed depression of limited utility (Field, 2005; Hosmer & Lemeshow, 2000; Young, Turner, Denny, & Young, 2004).

Table 4.10

Selectively-Reduced Model Logistic Regression: Symptoms Indicating Undiagnosed Depression

Variable	<i>B</i>		S.E.	Sig.	Exp(B)	95% C.I. for EXP(B)	
	<i>Difference</i>	<i>B</i>				Lower	Upper
Ethnicity	0.551	1.330	.072	p < .01	3.781	3.285	4.351
Disability/Pain	.060	.565	.038	p < .01	1.759	1.632	1.895

Hypotheses Testing Results

To address the research questions, two primary outcome variables were investigated: diagnosed depression and symptoms indicating undiagnosed depression. Both variables were operationalized as dichotomous, categorical variables. The predictor variables examined included: veteran era, sex, ethnicity, race, relationship status, physical inactivity, binge drinking, smoking, physical disability, and beliefs about mental health care usefulness. The rationale for selection of variables was based on general demographics and factors purported to impact mental health identified in the literature. As the relationship between each independent variable and dependent variable was investigated, a series of two hypotheses sets emerged. In each hypotheses set, 11 hypotheses were investigated for a total of 22 in this study. Significance levels for rejecting null hypotheses were set *a priori* at $p < .05$.

*Hypotheses set 1: Tests for relationships among predictor variables on **diagnosed depression**.*

The first research question asked: *To what extent are predictor variables of veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability and pain, and beliefs about the utility of mental health treatment associated with*

diagnosed cases of depression in veterans? Ten hypotheses were generated to address this research question:

1. Null hypothesis: Diagnosed depression will not have a significant relationship with veteran era in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression/Veteran Era}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with veteran era in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression/Veteran Era}} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between diagnosed depression and veteran era. A significant odds ratio with diagnosed depression was found ($p < .01$). Based on this result, the null hypothesis which stated that there would be no significant relationship between diagnosed depression and veteran era was rejected.

2. Null hypothesis: Diagnosed depression will not have a significant relationship with sex in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression/Sex}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with sex in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression/Sex}} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between diagnosed depression and sex. A significant odds ratio with diagnosed depression was found (Females 2.109 times more likely to be diagnosed than males, $p < .01$).

Based on this result, the null hypothesis which stated that there would be no significant relationship between diagnosed depression and sex was rejected.

3. Null hypothesis: Diagnosed depression will not have a significant relationship with ethnicity in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression}/\text{Ethnicity}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with ethnicity in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression}/\text{Ethnicity}} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between diagnosed depression and ethnicity. A significant odds ratio with diagnosed depression was found (Hispanics 1.212 times more likely to be diagnosed than non, $p < .01$).

Based on this result, the null hypothesis which stated that there would be no significant relationship between diagnosed depression and ethnicity was rejected.

4. Null hypothesis: Diagnosed depression will not have a significant relationship with race in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression}/\text{Race}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with race in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression}/\text{Race}} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between diagnosed depression and race. A significant odds ratio with diagnosed depression was found (African-Americans 1.199 times more likely to be diagnosed than whites,

$p < .01$). Based on this result, the null hypothesis which stated that there would be no significant relationship between diagnosed depression and race was rejected.

5. Null hypothesis: Diagnosed depression will not have a significant relationship with relationship status in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression/Relationship Status}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with relationship status in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression/Relationship Status}} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between diagnosed depression and relationship status. A significant odds ratio with diagnosed depression was found (Non-Partnered veterans 1.653 times more likely to be diagnosed than those in partner relationships, $p < .01$). Based on this result, the null hypothesis which stated that there would be no significant relationship between diagnosed depression and relationship status was rejected.

6. Null hypothesis: Diagnosed depression will not have a significant relationship with physical activity in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression/Physical Activity}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with physical activity in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression/Physical Activity}} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between diagnosed depression and physical activity. A significant odds ratio with diagnosed depression was found (Inactive veterans 1.808 times more likely to be diagnosed than

physically active veterans, $p < .01$). Based on this result, the null hypothesis which stated that there would be no significant relationship between diagnosed depression and physical activity was rejected.

7. Null hypothesis: Diagnosed depression will not have a significant relationship with binge drinking in a sample of military veterans.

$$H_0: OR_{Diagnosed\ Depression/Binge} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with binge drinking in a sample of military veterans.

$$H_A: OR_{Diagnosed\ Depression/Binge} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between diagnosed depression and binge drinking. A significant odds ratio with diagnosed depression was found (Binge drinkers 1.424 times more likely to be diagnosed than non, $p < .01$). Based on this result, the null hypothesis which stated that there would be no significant relationship between diagnosed depression and binge drinking was rejected.

8. Null hypothesis: Diagnosed depression will not have a significant relationship with smoking in a sample of military veterans.

$$H_0: OR_{Diagnosed\ Depression/Smoking} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with smoking in a sample of military veterans.

$$H_A: OR_{Diagnosed\ Depression/Smoking} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between diagnosed depression and smoking. A significant odds ratio with diagnosed depression was found (Smokers were 2.027 times more likely to be diagnosed than non, $p <$

.01). Based on this result, the null hypothesis which stated that there would be no significant relationship between diagnosed depression and smoking was rejected.

9. Null hypothesis: Diagnosed depression will not have a significant relationship with physical disability and pain in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression/Physical Disability}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with physical disability and pain in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression/Physical Disability}} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between diagnosed depression and disability. A significant odds ratio with diagnosed depression was found (Veterans who were physically disabled or suffering from chronic pain were 4.421 times more likely to be diagnosed than non, $p < .01$). Based on this result, the null hypothesis which stated that there would be no significant relationship between diagnosed depression and physical disability and pain was rejected.

10. Null hypothesis: Diagnosed depression will not have a significant relationship with beliefs about mental health care's usefulness in a sample of military veterans.

$$H_0: OR_{\text{Diagnosed Depression/Beliefs}} > 1$$

Alternative hypothesis: Diagnosed depression will have a significant relationship with beliefs about mental health care's usefulness in a sample of military veterans.

$$H_A: OR_{\text{Diagnosed Depression/Beliefs}} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between diagnosed depression and beliefs about the utility of mental health care. A significant odds ratio with diagnosed depression was found (favorable beliefs were 23.876 times

more likely to be diagnosed than non, $p < .01$). Based on this result, the null hypothesis which stated that there would be no significant relationship between diagnosed depression and beliefs about mental health care was rejected.

The second research question asked: *Do significant variables correlate in multivariate analysis with diagnosed cases of depression in veterans?* One hypothesis was generated to address this research question.

11. Null hypothesis: Diagnosed depression will not be significantly predicted by variables that demonstrated significant association in univariate analysis including: veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability, and beliefs about mental health care usefulness considered together in a sample of military veterans.

$$H_0: \beta_1 = \beta_2 = \beta_3 \dots = 0$$

Alternative hypothesis: Diagnosed depression will be significantly predicted by variables that demonstrated significant association in univariate analysis including: veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability, and beliefs about mental health care usefulness considered together in a sample of military veterans.

$$H_0: \beta_1 = \beta_2 = \beta_3 \dots \neq 0$$

Binary logistic regression was employed using stepwise protocol to model the predictors of veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability, and beliefs about mental health care usefulness on diagnosed depression. When controlling for collinearity and the presence of other variables in the full model, the variables of race, ethnicity, and binge drinking lacked significance. The model with remaining

variables demonstrated fit (predicted percentages = 87.3%) and significance ($p < .01$) indicating that the predictors of veteran era, sex, relationship status, activity, smoking, physical disability, and beliefs about mental health care usefulness, as a set, reliably distinguished between veterans with a depression diagnosis and those who did not have one. A selectively-reduced model including the practically significant predictors (*Odds ratio* > 1.5) of sex, physical disability, and beliefs about mental health care usefulness was also significant ($p < .01$) (Cohen et al., 2000; Wolf, 1986). Based on this result, the null hypothesis which stated that there would be no significant relationship between diagnosed depression and variables that demonstrated significant association in univariate analysis including: veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability, and beliefs about mental health care usefulness considered together in a sample of military veterans was rejected.

*Hypotheses set 2: Tests for relationships among predictor variables on **symptoms indicating undiagnosed depression**.*

The third research question asked: *To what extent are predictor variables of veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, physical disability and pain, and beliefs about the utility of mental health treatment associated with self-reported feelings of poor mental health that indicate undiagnosed depression in veteran respondents?* Ten hypotheses were generated to address this research question:

12. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with veteran era in a sample of military veterans.

$$H_0: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Veteran Era}} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with veteran era in a sample of military veterans.

$$H_A: OR_{Symptoms\ of\ Undiagnosed\ Depression/Veteran\ Era} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between symptoms indicating undiagnosed depression and veteran era. A significant odds ratio with symptoms indicating undiagnosed depression was found ($p < .01$). Based on this result, the null hypothesis which stated that there would be no significant relationship between symptoms indicating undiagnosed depression and veteran era was rejected.

13. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with sex in a sample of military veterans.

$$H_0: OR_{Symptoms\ of\ Undiagnosed\ Depression/Sex} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with sex in a sample of military veterans.

$$H_A: OR_{Symptoms\ of\ Undiagnosed\ Depression/Sex} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between symptoms indicating undiagnosed depression and sex. A significant odds ratio with symptoms indicating undiagnosed depression was found (Females 1.72 times more likely to display symptoms that indicate undiagnosed depression than males, $p < .01$). Based on this result, the null hypothesis which stated that there would be no significant relationship between symptoms indicating undiagnosed depression and sex was rejected.

14. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with ethnicity in a sample of military veterans.

$$H_0: OR_{Symptoms\ of\ Undiagnosed\ Depression/Ethnicity} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with ethnicity in a sample of military veterans.

$$H_A: OR_{Symptoms\ of\ Undiagnosed\ Depression/Ethnicity} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between symptoms indicating undiagnosed depression and ethnicity. A significant odds ratio with symptoms indicating undiagnosed depression was found (Hispanics 3.448 times more likely to display symptoms that indicate undiagnosed depression than non, $p < .01$). Based on this result, the null hypothesis which stated that there would be no significant relationship between symptoms indicating undiagnosed depression and ethnicity was rejected.

15. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with race in a sample of military veterans.

$$H_0: OR_{Symptoms\ of\ Undiagnosed\ Depression/Race} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with race in a sample of military veterans.

$$H_A: OR_{Symptoms\ of\ Undiagnosed\ Depression/Race} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between symptoms indicating undiagnosed depression and race. A significant odds ratio with symptoms indicating undiagnosed depression was found (African-Americans 1.381 times more likely to display symptoms that indicate undiagnosed depression than whites, $p < .01$). Based on this result, the null hypothesis which stated that there would be no significant relationship between symptoms indicating undiagnosed depression and race was rejected.

16. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with relationship status in a sample of military veterans.

$$H_0: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Relationship Status}} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with relationship status in a sample of military veterans.

$$H_A: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Relationship Status}} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between symptoms indicating undiagnosed depression and relationship status. A significant odds ratio with symptoms indicating undiagnosed depression was found (Non-Partnered veterans are 1.323 times more likely to display symptoms that indicate undiagnosed depression than those in partner relationships, $p < .01$). Based on this result, the null hypothesis which stated that there would be no significant relationship between symptoms indicating undiagnosed depression and relationship status was rejected.

17. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with physical activity in a sample of military veterans.

$$H_0: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Physical Activity}} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with physical activity in a sample of military veterans.

$$H_A: OR_{\text{Symptoms of Undiagnosed Depression} / \text{Physical Activity}} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between symptoms indicating undiagnosed depression and physical activity. A significant odds ratio with symptoms indicating undiagnosed depression was found (Inactive veterans 1.19 times more likely to display symptoms that indicate undiagnosed depression than physically active veterans, $p < .01$). Based on this result, the null hypothesis which stated that

there would be no significant relationship between symptoms indicating undiagnosed depression and physical activity was rejected.

18. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with binge drinking in a sample of military veterans.

$$H_0: OR_{\text{Symptoms of Undiagnosed Depression/Binge}} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with binge drinking in a sample of military veterans.

$$H_A: OR_{\text{Symptoms of Undiagnosed Depression/Binge}} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between symptoms indicating undiagnosed depression and binge drinking. A significant odds ratio with symptoms indicating undiagnosed depression was found (binge drinkers 2.141 times more likely to display symptoms that indicate undiagnosed depression than non, $p < .01$). Based on this result, the null hypothesis which stated that there would be no significant relationship between symptoms indicating undiagnosed depression and binge drinking was rejected.

19. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with smoking in a sample of military veterans.

$$H_0: OR_{\text{Symptoms of Undiagnosed Depression/Smoking}} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with smoking in a sample of military veterans.

$$H_A: OR_{\text{Symptoms of Undiagnosed Depression/Smoking}} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the

association between symptoms indicating undiagnosed depression and smoking. A significant odds ratio with symptoms indicating undiagnosed depression was found (smokers 1.712 times more likely to display symptoms that indicate undiagnosed depression than non, $p < .01$). Based on this result, the null hypothesis which stated that there would be no significant relationship between symptoms indicating undiagnosed depression and smoking was rejected.

20. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with physical disability in a sample of military veterans.

$$H_0: OR_{\text{Symptoms of Undiagnosed Depression/Physical Disability}} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with physical disability in a sample of military veterans.

$$H_A: OR_{\text{Symptoms of Undiagnosed Depression/Physical Disability}} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between symptoms indicating undiagnosed depression and physical disability and pain. A significant odds ratio with symptoms indicating undiagnosed depression was found (veterans who were physically disabled or suffering from chronic pain were 1.718 times more likely to display symptoms that indicate undiagnosed depression than non, $p < .01$). Based on this result, the null hypothesis which stated that there would be no significant relationship between symptoms indicating undiagnosed depression and physical disability and pain was rejected.

21. Null hypothesis: Symptoms indicating undiagnosed depression will not have a significant relationship with beliefs about mental health care's usefulness in a sample of military veterans.

$$H_0: OR_{\text{Symptoms of Undiagnosed Depression/Beliefs}} > 1$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will have a significant relationship with beliefs about mental health care's usefulness in a sample of military veterans.

$$H_A: OR_{\text{Symptoms of Undiagnosed Depression/Beliefs}} = 1$$

Crosstabs and univariate logistic regression analyses calculated the strength of the association between symptoms indicating undiagnosed depression and beliefs about the utility of mental health care. A significant odds ratio with symptoms indicating undiagnosed depression was not found ($p = .629$). Based on this result, the null hypothesis which stated that there would be no significant relationship between symptoms indicating undiagnosed depression and beliefs about mental health care was accepted.

The final research question asked: *Do significant variables correlate in multivariate analysis with self-reported feelings of depression in veteran respondents?* One hypothesis was generated to address this research question.

22. Null hypothesis: Symptoms indicating undiagnosed depression will not be significantly predicted by variables that demonstrated univariate association including: veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, and physical disability, considered together in a sample of military veterans.

$$H_0: \beta_1 = \beta_2 = \beta_3 \dots = 0$$

Alternative hypothesis: Symptoms indicating undiagnosed depression will be significantly predicted by variables that demonstrated univariate association including: veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, and physical disability, considered together in a sample of military veterans.

$$H_A: \beta_1 = \beta_2 = \beta_3 \dots \neq 0$$

Binary logistic regression was employed using stepwise protocol to model the predictors of veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, and physical disability on undiagnosed depression. When controlling for collinearity and the presence of other variables in the full model analysis, the variables of race and physical activity lacked significance. The model with remaining variables demonstrated fit (predicted percentages = 93.2%) and significance, ($p < .01$) indicating that the predictors of veteran era, sex, ethnicity, relationship status, binge drinking, and smoking, as a set, reliably distinguished between veterans with a symptoms indicating symptoms indicating undiagnosed depression and those who did not display such symptoms. A selectively-reduced model including the practically significant predictors (*Odds ratio* > 1.5) of ethnicity and physical disability was also significant ($p < .01$). Based on this result, the null hypothesis which stated that there would be no significant relationship between symptoms indicating undiagnosed depression and variables that demonstrated significant association in univariate analysis including: veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, and physical disability, considered together in a sample of military veterans, was rejected.

Summary of the Results

Chapter four detailed the outcomes of this investigation. Descriptive statistics described the characteristics of the sample. Crosstab analysis identified odds ratios and highlighted the effect size of relationships between predictor and outcome variables. Univariate logistic regression identified correlations between diagnosed depression, symptoms indicating undiagnosed depression, and ten predictor variables including: veteran era, sex, ethnicity, race,

relationship status, physical activity, binge drinking, smoking, disability & pain, and opinions about the usefulness of mental health care. Stepwise multivariable logistic regression as well as selectively-reduced multivariable logistic regression modeled the predictors of diagnosed and symptoms indicating undiagnosed depression in veterans. Adequate model fit was indicated. The findings of this research provided some possible models for intervention development targeting mental wellness in veterans.

CHAPTER 5

CONCLUSIONS AND DISCUSSION

Suicide is a major health problem in the military community. Conservative estimates indicate that numbers of attempts and completions have increased since 1995, and are currently hovering at 22 veterans taking their own lives each day, along with one active duty service member per day (Department of Defense, 2013). While clinical health services are available for personnel with existing mental health conditions like depression and posttraumatic stress, (in earlier periods called posttraumatic stress disorder), they are not adequate; the rising tide of service related suicides continues (Coughlin, 2012). Gaining a better understanding of depression in the veteran population is vital to health promotion programming in the military community (Hoge, 2012; Malmin, 2013). A number of studies have attempted to explore the issue of depression and PTS in veterans, but ranges and rates vary widely and predictive models that could guide programming are lacking (Gironda, Clark, Massengale, & Walker, 2006; Seal et al., 2009; Tanielian & Jaycox, 2008). The purpose of this study was to examine the relationship between ten key variables and rates of diagnosed depression and symptoms indicating undiagnosed depression in a national sample of veterans to generate predictive models for the condition in military veterans. The findings of this study aided in identifying demographic and behavioral health predictors of depression (both diagnosed and undiagnosed) in the military veteran population. Ultimately, the results of this investigation provided some possible models for intervention development targeting depression in veterans.

In chapter five, in light of the tested hypotheses, conclusions were drawn and practical implications highlighted for intervention targeting. This chapter expounds upon the implications of study results for health education and promotion and for future research on depression in military veterans. Finally, this chapter addresses limitations of the current study.

Discussion

The findings of this study agree with the academic literature that the prevalence of veteran depression, both diagnosed and undiagnosed, is a problem for the demographic (Magni, Marchetti, Moreschi, Merskey, & Luchini, 1993; Miller & Cano, 2009; Ohayon & Schatzberg, 2003). Almost fifteen percent (14.9%) of the veterans in this study sample had a depression diagnosis, and an additional 7.7% showed symptoms of the undiagnosed condition. Studying mental health can be a complicated process, as symptoms manifest on multiple levels and vary greatly from one patient to the next. In the military, understanding mental health is important from two key angles. Prevention of illness and stress disorders saves the services money and training time, and treatment of conditions accrued during service is an ethical responsibility (Meredith et al., 2011). The Department of Defense and Veteran's Administration have made combatting depression from both angles a major priority, specifically because it is a known predictor of suicide (Bossarte, 2013).

Researchers seeking to prevent depression in military personnel or to design programs to reach veterans currently suffering can derive delivery timing and content knowledge from a study of contemporary Resiliency Theory. Resiliency Theory as it applies to health behavior change is a powerful paradigm from which to approach research and programming, primarily

because it promotes a model of agency and client control. Research has shown that, indeed, much of what seems to promote positive adaptation despite adversity does originate outside of the individual — in the family, the community, the society, the culture, and the environment (Richardson et al., 1990). Further research has led to the concepts of resilient reintegration, whereby a confrontation with adversity can lead for some to a new level of growth, indicating that resilience is something innate that needs only to be properly awakened (Fleming and Ledogar, 2008).

Working with veterans and military personnel who have been subject to the stresses and traumas of the last decade of war requires a focus on agency and resilience, not simply an understanding of the scope and seriousness of depression problems in the target group. By framing an understanding of veteran depression within a clear understanding of warrior culture and operating from the paradigm of the contemporary Resilience Model, health-promoting inroads can be made that heretofore have not been in this population. The relationship between exposure to combat stressors and poorer post deployment health is well documented (Coughlin, 2012; Hoge, 2010). Still, some individuals are more psychologically resilient to such outcomes than others, and increasing understanding of resilience within given communities and populations may help target programming (Richardson, 2002).

Diagnosed Depression and Predictor Variables

In this investigation, diagnosed depression was significantly associated in univariate analysis with the predictor variables of veteran era, sex, ethnicity, race, relationship status,

physical activity, binge drinking, smoking, physical disability, and beliefs about mental health care usefulness. In the multivariate analysis, when controlling for collinearity and the presence of other variables, the full model logistic regression analysis showed greatest statistical and practical significance for the variables of sex, relationship status, physical activity, smoking, disability and pain, and beliefs about the usefulness of mental health treatment.

Broken down by categories that highlight both age and service era, veteran era analysis indicated information that could help programmers understand who is receiving depression diagnoses and more importantly, who is not. The most likely group to receive a depression diagnosis were veterans of the Gulf War, (*Odds ratio* = 2.164), followed by veterans of Vietnam (*Odds ratio* = 2.02) and Operations Iraqi/Enduring Freedom (*Odds ratio* = 1.748). Korean War veterans were the least likely group to have a diagnosis, and were used as the reference category for odds ratio calculation.

Possible explanations for the differences seen in depression diagnoses between veterans of different eras include issues of stigma and culture as well as key access to care issues (Koo, et al., 2014; VA Mental Health, 2011). Navigating the bureaucratic maze of the contemporary Veteran's Health Administration can seem daunting to newly-discharged veterans, who also lack motivation to assume a patient identity in the first place (Malmin, 2013). Within the military community, much of the issue lies not in lack of screening for depressive disorders, nor in the medical care available to service members suffering from depression. The problem is getting veterans to avail themselves of treatment services (Held & Owens, 2013). In one post-deployment study, 42% of screened reserve and National Guard soldiers answered questions in such a way that they were flagged as being in need of evaluations and possible treatment.

However, only half of those soldiers referred sought treatment. Only 30% of those that sought treatment followed the basic program through the full eight sessions (Coughlin, 2012).

The variable sex was significantly associated with diagnosed depression. Analyses indicated that women were more than twice as likely as men to have a depression diagnosis, (*Odds ratio* = 2.109) indicating practical significance (Breaugh, 2003). These findings agree with the literature. Durhart (2012) indicated that female veterans returning from deployment were more likely than their male counterparts to report mental health concerns such as PTS, depression and suicidal thoughts. Koo (2014) reported that women were more likely to screen positively for depression both before and after deployments.

Targeting programs to women must take into consideration several facets of the female military experience that differ from their male counterparts. In a minority position, women may be less likely to feel strong social support bonds at the unit level. Health disparities research clearly demonstrates that discrimination and lowered levels of peer affiliation increase stress (Rogers & Kelly, 2011).

Unfortunately, the masculinized culture of the military carries with it the problems of contemporary rape culture; women are likely to experience Military Sexual Trauma. During screenings, 1 in 5 women and 1 in 100 men report experiencing Military Sexual Trauma during their time in service (Burns, et al., 2014). The issue of betrayal after a traumatic event is a major reason that survivors of Military Sexual Trauma are at risk for developing PTS. Sexual assault commonly causes major depression in civilians, and the risk is compounded in the military because of the close nature of the working relationships between perpetrator and victim, as well as institutional issues that make prosecution of offenses unlikely (Service Women's Action Network, 2014).

Though statistically significant, the practical significance of race and ethnicity in the current study indicated that African Americans were only slightly more likely than whites to receive a depression diagnosis, (*Odds ratio* = 1.199) and Hispanics were only slightly more likely than non-Hispanics, (*Odds ratio* = 1.212). This indicates targeting racial and ethnic minority groups with diagnosed depression may not be appropriate or necessary in veteran populations. Results should be further researched, however, as racial and ethnic minority status is a proven predictor of poorer health outcomes in disparities research, even when controlling for socioeconomic status (Blitstein, 2009). In some military-sponsored studies on depression and posttraumatic mental health issues, minority status has not consistently been found to be a significant predictor of the condition (Coughlin, 2012) or to be a major factor in treatment processes or program outcomes (Rosenhock & Fontana, 2002). It is possible that codified training standards help perceptions of difference and erase racial and ethnic barriers. This may contribute to social support levels between male members of a unit being higher than in the civilian population.

Relationship status was associated with diagnosed depression in the current study, with significance both statistical and practical. Analysis indicated that veterans not in partnerships (divorced, widowed, or single) were 1.653 times more likely than those in partnerships (married, cohabiting, or seriously-dating) to receive a depression diagnosis. The findings of the present study agree with the literature. Social support is a known contributor to health and longevity, with recent studies indicating that high levels add 7.5 years to the average American life expectancy (Egolf, Lasker, Wolf, & Potvin, 1992; Rankin, 2013). While not all kinds of social interactions produce similar health consequences, intimate partnerships are considered a reliable indicator of social support (Cohen, Underwood, & Gottlieb, 2000; Cutrona, 1996). This finding

is important because it suggests expanding the scope of programming to prevent depression beyond the current focus on social support at the unit level; it suggests new urgency to family programming that is integrated and prioritized.

In analysis, physical activity was significantly associated with diagnosed depression. Results indicated that veterans who did not engage in physical activity were 1.808 times more likely than those who exercised to also have a depression diagnosis, indicating practical significance and risk for the inactive population. The findings of the present study are consistent with the literature. Exercise may be more effective than prescription drugs in treating and controlling depression. A review of 64 studies evaluating the effects of exercise on mental health showed that exercise relieved depression, improved self-esteem and enhanced work behavior (Norris, 2003). Additional reviews looking at randomized controlled trials reported overwhelmingly that exercise can be as effective as medications in treating depression (Eriksson & Gard, 2011). This finding underscores the vital need for holistic programming that considers health on multiple levels, with physical movement practices incorporated as a matter of course (Rankin, 2013).

Practical significance of smoking and binge drinking in analysis indicated that veterans who engaged in both behaviors were more likely than those who did not to also have a depression diagnosis, ($Odds\ ratio_{Binge} = 1.424$; $Odds\ ratio_{Smoking} = 2.027$) indicating risk for these populations. The findings of the present study agree with the literature. Often accompanying a diagnosis of depression in any population are self-medicating behaviors. Smoking, alcohol and drug abuse are associated in the general population with depression symptoms, often used as a “mask” for problems or an escape from reality (Mayo Clinic, 2013). In the military community, risk of tobacco, alcohol and drug abuse increases with deployment to a war zone (Beattie,

Battersby, & Pols, 2013; Bossarte, 2013). A study of 63,397 veteran patients showed that fully 25% demonstrated unhealthy alcohol use patterns (Williams et al., 2014). Military smoking rates are higher than in the civilian population. One study showed 49% reported using some form of tobacco (Ornelas, Benne, & Rosencrantz, 2012). In contrast, researchers from the Cancer Intervention and Surveillance Modeling Network report that 20% of adult Americans in the general population now smoke, compared to 50% in 1964 (Sifferlin, 2014). These results are important reminders to programmers and underscore the usefulness of screening questions; masking behaviors may be strong predictors of depressive conditions.

The presence of physical disability or chronic pain was significantly associated with diagnosis of depression. Both importance to the individual and practical significance were indicated for the disabled, who were 4.421 times more likely to also have diagnoses of depression than the non-disabled. The present study's findings are in agreement with the literature. A cross-sectional study of 884 VA patients at 4 hospital sites found that physical pain and disability often accompanied mental health diagnoses (Magruder, et al., 2012). The results of the present study also show such correlation, but the association may be simply that veterans in treatment for a physical condition are more likely to have contact with providers that offer opportunity to be diagnosed. However, the use of medications to treat chronic physical conditions is problematic (Clark, 2004; Spelman et al., 2012). In the United States, pain medications are the most frequently prescribed medications on the market and clinicians express concern about the misuse problems that come along with opioid pain medications (Green, Wheeler, Marchant, LaPorte, & Guerrero, 2001; Turk & Okifuji, 2002). In a survey of physicians working at Veteran's Administration medical facilities, 40% of clinicians expressed concern about dependence in patients, and 20% believed that at least half their patients became

addicted to prescription pain medications during the course of normal treatment (Dobscha, Corson, Flores, Tansill, & Gerrity, 2008). Addiction may create depression in veterans already struggling with physical injury, making it vital that programming consider the issue when creating content.

Beliefs about the usefulness of mental health treatment were associated with diagnosed depression at both statistically and practically significant levels. Veterans who held favorable views were almost 24 times more likely to also have a depression diagnosis than those respondents who were undiagnosed. (*Odds ratio* = 23.876). The literature indicates the likely reason for such strong correlation. Researchers found that respondents who had received professional diagnoses were more likely to agree that mental health care was effective than undiagnosed peers; a smaller number of non-diagnosed respondents agreed that it was effective (Kobau et al., 2011). Contact with and meaningful exposure to the existing mental health care system is more likely for the diagnosed veteran, as is a resulting belief that treatment is worthwhile (Greden, et al., 2010).

A key component of depression programming must consider stigma against care-seeking. Once in treatment, perceptions of mental health services improve markedly (Kobau et al., 2011). Part of the stigma issue is the stated disconnect combat veterans feel from civilians, even civilian mental health professionals who treat the military population. Service members and veterans often feel they're wasting their time dealing with people who can't relate to their perspective, and may actually feel more comfortable in the war zone (Hoge, 2010). Another glaring problem surrounding seeking initial help and adhering to a program lies in the stigma that surrounds mental health treatment and care. This has been confirmed in study after study - when veterans were asked why they avoided even recommended care, stigma was identified as a major barrier

(Currier, Holland, & Allen, 2012; Elnitsky et al., 2013; Koo, 2014). The most important challenges in suicide prevention are stigma surrounding mental illness, negative perceptions of treatment, and other barriers (including confidentiality in the military setting) that result in the majority of service members not accessing care when needed or dropping out prematurely (Held & Owens, 2013).

Stepwise and selectively-reduced logistic regression produced models of statistical significance that may provide guidance for intervention targeting. The stepwise model with remaining variables demonstrated fit (predicted percentages = 87.3%) and significance, ($p < .01$) indicating that the predictors of veteran era, sex, relationship status, activity, smoking, physical disability, and beliefs about mental health care usefulness, as a set, reliably distinguished between veterans with a depression diagnosis and those who did not have one. A selectively-reduced model including the practically significant predictors (*Odds ratio* > 1.5) of sex, physical disability, and beliefs about mental health care usefulness also demonstrated fit (predicted percentages = 85%) and significance ($p < .01$) (Breagha, 2003). However, due to the low variance explained by each model in the present study using Nagelkerke's R^2 test, ($R^{2\text{stepwise}} = .20$; $R^{2\text{selective}} = .183$) more useful information may be derived from the practical significance results of the univariate analysis.

Undiagnosed Depression and Predictor Variables

Major depression is linked to suicide risk, and presents a public health problem that the services struggle to deal with (Shen, Arkes, Kwan, Tan, & Williams, 2009). Understanding prevalence and risk for undiagnosed depression is important in the veteran population, as current estimates of the problem vary widely (Coughlin, 2012; Hoge, 2012). Warrior culture promotes avoidance of patient-identities, and as a result the problem of depression is not fully understood in veterans (Malmin, 2013).

Undiagnosed depression was operationalized in the present study as self-reported poor mental health for a given period of time. Depression symptoms are varied and present themselves differently in each individual, so perception of overall poor mental health may be a useful indication of undiagnosed depression (Mayo Clinic, 2013). The undiagnosed depression variable was recoded to eliminate respondents who were already medically-diagnosed with a depressive condition ($n = 45,987$). For purposes of this analysis, self-reported symptoms presence anywhere from 5-30 days was coded to indicate likely undiagnosed depression. This invited comparability with the variable indicating diagnosed depression, which also grouped severity levels of mild, moderate, and major depression together.

Undiagnosed depression was significantly associated with the predictor variables of veteran era, sex, ethnicity, race, relationship status, physical activity, binge drinking, smoking, and physical disability in this study. Crosstabs and logistic regression analysis showed greatest practical significance (*Odds ratio* > 1.5) for the variables of sex, ethnicity, physical activity, smoking, and binge drinking.

Examined by categories that highlight both age and service era, veteran era analysis indicated information that could help programmers understand prevalence rates of undiagnosed depression in each population. The most likely group to present symptoms that indicate undiagnosed depression were younger veterans of OIF/OEF, (*Odds ratio* = 4.209), followed by veterans of the Gulf War (*Odds ratio* = 1.934) and Vietnam (*Odds ratio* = 1.098). Korean War veterans were the least likely group to present symptoms, and were used as the reference category for odds ratio calculation. This indicates practical significance for veterans of OIF/OEF and the Gulf Wars and suggests targeting interventions towards these groups (Fields, 2005).

These results also indicate that stigma and access to care problems disproportionately affect young OIF/OEF veterans. Outreach to newly-discharged veterans should increase, as should program delivery pre-discharge. Stigma is rampant, and a challenge for programming is to normalize the use of available mental health services within this population (Greden, et al, 2010).

The variable sex was significantly associated with undiagnosed depression in the present study. Analyses indicated that women were more likely than men to present symptoms that indicate undiagnosed depression, (*Odds ratio* = 1.720) indicating practical significance. These findings agree with the literature, and as was the case with the outcome variable of diagnosed depression, targeted programming for women was indicated. Research suggests that female veterans returning from deployment are more likely than their male counterparts to report mental health concerns such as PTS, depression and suicidal thoughts (Duhart, 2012). Women are also more likely to screen positively for depression both before and after deployments (Koo, 2014).

African Americans were more likely than whites to present symptoms that indicate undiagnosed depression, (*Odds ratio* = 1.381) at statistically significant levels ($p < .01$). In some

military-sponsored studies on depression and posttraumatic mental health issues, minority status has not consistently been found to be a significant predictor of the condition (Coughlin, 2012) or to be a major factor in treatment processes or program outcomes (Rosenhock & Fontana, 2002). Ethnicity was also associated with undiagnosed depression (Cohen, 1988). The practice of separating these categories has been critiqued by the US Commission on Civil Rights; race and ethnicity are closely linked in studies of health issues for minorities, and must both be considered in any discussion of the topic (Lee & Skrentny, 2010). Odds ratios demonstrated practical significance of the ethnicity variable (*Odds ratio* = 3.448). Hispanics were 3.448 times more likely than non-Hispanics to display symptoms that indicate undiagnosed depression indicating risk for the Hispanic veteran population.

Future study is warranted, as the ethnicity variable in the present study underrepresented Hispanic veterans. Conflict in the literature on health disparities in civilian populations and in military settings should be further examined. Though some research in military populations has shown negligible race and ethnic impact on mental health outcomes, (Coughlin, 2012; Rosenhock & Fontana, 2002), the impact is unclear. Additional literature suggests that minority status is important to consider, specifically in terms of access and attitudes towards treatment available (Gomez & Lopez, 2013). The causes of these empirical discrepancies are numerous and complex and involve socioeconomic status, exposure to chronic stress, and social disadvantages that may impair access to health services or that subject minorities to the health risks of disadvantaged environments (Adler & Rehkopf, 2008). To validate racially and ethnically-targeted programming, more research with truly representative variables is needed.

Relationship status was significantly associated with undiagnosed depression. Analysis indicated that veterans not in partnerships (divorced, widowed, or single) were more likely than

those in partnerships (married, cohabiting, or seriously-dating) to present symptoms that indicate undiagnosed depression, (*Odds ratio* = 1.323). This indicates some risk in the non-partnered population for undiagnosed depression. The findings of the present study agree with the literature. Social support is a known contributor to health and longevity, with recent studies indicating that high levels add 7.5 years to the average American lifespan (Egolf, Lasker, Wolf, & Potvin, 1992; Rankin, 2013). While not all kinds of social interactions produce similar health consequences, intimate partnerships are considered a reliable indicator of social support (Cohen, Underwood, & Gottlieb, 2000; Cutrona, 1996). Future research should seek clearer variables to operationalize social support; the present study indicated the presence of partnerships, not noting the perceived quality of those partnerships.

In analysis, physical activity was significantly associated with undiagnosed depression, but limited in terms of practical significance (*Odds ratio* = 1.190). Results indicated that veterans who do not exercise are slightly more likely than those who do to present symptoms indicating undiagnosed depression. The findings of the present study are consistent with the literature, but do not stand the test of practical significance. Exercise as a component of program content is indicated by the present study, but activity levels as predictors of undiagnosed depression are of limited utility in current findings. The literature resoundingly supports the usefulness of exercise for improving mental health. Exercise may be more effective than prescription drugs in treating and controlling depression. A review of 64 studies evaluating the effects of exercise on mental health showed that exercise relieved depression, improved self-esteem and enhanced work behavior (Norris, 2003). Additional reviews looking at randomized controlled trials reported overwhelmingly that exercise can be as effective as medications in treating depression (Eriksson & Gard, 2011).

Practical significance of smoking and binge drinking in analysis indicated that veterans who engage in both behaviors were more likely than those who do not to also have undiagnosed depression, ($Odds\ ratio_{Binge} = 2.141$; $Odds\ ratio_{Smoking} = 1.712$) indicating risk for these populations. The findings of the present study agree with the literature. Often accompanying a diagnosis of depression in any population are self-medicating behaviors. Alcohol and drug abuse are associated in the general population with depression symptoms, often used as a “mask” for problems or an escape from reality (Mayo Clinic, 2013). In the military community, risk of tobacco, alcohol and drug abuse increases with deployment to a theater of war (Beattie, Battersby, & Pols, 2013; Bossarte, 2013). As was the case with the outcome variable of diagnosed depression, these results are important reminders to programmers and underscore the usefulness of screening questions; masking behaviors may be strong predictors of depressive conditions.

The presence of physical disability or chronic pain was significantly associated with undiagnosed depression. Importance to the individual and practical significance were indicated for the disabled, who were more likely to display undiagnosed depression symptoms ($Odds\ ratio = 1.718$), indicating risk for this group. Veterans suffering from disability and chronic pain are more at risk for co-morbid mental health issues (Magruder, et al., 2012). The relationship between physical disability and mental health should be explored further as a possible predictor of undiagnosed depression. Having a medical condition that requires treatment makes a veteran more likely to be diagnosed with depression, but the results of the present study also indicate that the presence of physical disability and chronic pain also matter for veterans suffering with undiagnosed depression. Treatment protocols that emphasize addictive medications or do not pursue recovery from a holistic approach are contraindicated for veterans. Programmers must

remember how vital content components emphasizing agency, adaptive wellness, peer support, and mobility are to veterans; these patients are used to the demands of warrior culture mentally, professionally, socially, and physically (Malmin, 2013).

Beliefs about the usefulness of mental health treatment were not associated with undiagnosed depression at either statistically or practically significant levels ($p = .629$).

Veterans who held favorable views were not significantly more likely than those who held non-favorable views to display symptoms of undiagnosed depression. Most veterans in the present study held unfavorable views about mental health treatment's utility (97.8%). These findings buttress the literature, which extensively discusses rampant treatment stigma in the military and veteran communities, (Greden, et al., 2010; Malmin, 2013) but demonstrate that such a cultural barrier to care may not be a reliable predictor of undiagnosed depression because negative beliefs about treatment are too widely-held.

Stepwise and selectively-reduced logistic regression produced models of statistical significance that may provide guidance for intervention targeting. The stepwise model with remaining variables demonstrated fit (predicted percentages = 93.2%) and significance, ($p < .01$) indicating that the predictors of veteran era, sex, ethnicity, relationship status, binge drinking, and smoking, as a set, reliably distinguished between veterans with a symptoms indicating undiagnosed depression and those who did not display such symptoms. A selectively-reduced model including the practically significant predictors (*Odds ratio* > 1.5) of ethnicity and physical disability demonstrated fit (predicted percentages = 92.6%) and significance ($p < .01$). However, due to the low variance explained by each model in the present study, ($R^{2\text{stepwise}} = .082$; $R^{2\text{selective}} = .025$) more useful information may be derived from the practical significance results of the univariate analysis.

Implications for Health Promotion and Education

The results of this investigation suggest that practitioners should focus intervention efforts on practically-significant predictors. An understanding of Resiliency Theory can buttress those results and assist programmers by guiding program timing, delivery, tone, and content. In this study, crosstabs and logistic regression analyses showed greatest practical significance for the variables of sex, relationship status, physical activity, smoking, disability and pain, and beliefs about the usefulness of mental health treatment on the outcome variable of diagnosed depression. Symptoms indicating undiagnosed depression's association with the variables of sex, ethnicity, physical activity, smoking, and binge drinking showed the greatest levels of practical significance.

Noted psychologists and psychiatrists have suggested that competency and resiliency characteristics are strengths that are more protective than risk reduction efforts (Connor & Davidson, 2003). Tested specifically for validity in military communities, resiliency scales measuring traits that offer protective effects against depression emphasize adaptability (Green et al., 2014).

The expanded view of health education and disease/illness prevention that a resiliency-based prevention-focus offers includes perspectives on the value of personal disruption and adversity as avenues to promote growth. Such disruption handled in adaptable fashion can increase protective factors against post-trauma depression and anxiety (Fleming & Ledogar, 2008). The process of psychological reintegration is the ability to learn new skills from the disruptive experience and put life's perspective back in a way that will increase abilities to

negotiate life events (Richardson, 2002). Research examining the role of protective factors in buffering against PTSD and depressive symptoms in veterans is limited, but early studies show promise. A pilot study of 272 returning National Guard soldiers after a deployment to Iraq demonstrated that high levels of resilience characteristics fully mediated the likelihood of self-reported depressive symptoms (Pietrzak, et al., (2010).

A review of both literature and current study results indicates that targeting interventions according to risk population is vitally-important, as is creating content that is culturally-palatable to the intended recipients. The challenge for health professionals looking to stem the tide of service suicides and improve quality of life for veterans lies in shifting the paradigm away from a focus on problems and towards theories and methods of resiliency cultivation, preparation, and self-care practices. The Department of Defense has begun to see the validity of such behavioral health interventions in Wounded Warrior recovery programs aimed to treat service members with existing cases of depression, and is slowly expanding research partnerships with universities like the Uniformed Services University of Health Sciences, Columbia, Johns Hopkins, Georgetown, and American University in Washington DC to validate such treatment methods. Some of the research efforts are explicitly clinical, and apply rigorous prospective, mixed-methods models (Libby et al., 2012). Cultural analysis and examination of ecologically-focused Resiliency Theory suggest that the ways health promoters bring programs to veterans must emphasize assets and agency (Malmin, 2013). Working with veterans and military personnel who have been subject to the stresses and traumas of the last decade of war requires a focus on resilience-building as prevention, not simply an understanding of the scope and seriousness of depression problems in the target group. By framing an understanding of veteran depression within a clear understanding of warrior culture and operating from the paradigm of the

contemporary Resilience Model, health-promoting inroads may be made that heretofore have not been in this population, simply by shifting the focus away from a patient-care model.

The predictor variable highlighting beliefs about the utility of mental health treatment is extremely useful in this regard, simply because it demonstrates empirically how rampant stigma against mental health care is among the veteran population. The answer to reducing stigma must be creatively formulated and has to consider the language of warrior subculture (Malmin, 2013). Culturally, health promotion programs seeking to target mental health interventions must be cautious and creative with content. Marines and soldiers are competitive individualists who respond more favorably to notions of challenge than to victim or patient identities (Greden et al., 2010; Jha, et al., 2009).

Traditional program timing that occurs at post-trauma treatment can be expanded to standard service training to include training commands and fleet units. A prevention-focused training timeline may be indicated and should be studied further. Regarding content improvement, including resilience training as another component of optimal combat readiness, health educators can establish mental health promotion as a crucial component of mission preparedness. Turning to agentic notions of self-care, health promoters can modify stress management and resilience-building therapies to help such therapies resonate with this community.

Limitations

When considering the findings of this report, a number of limitations to this study must be acknowledged, including its overall exploratory nature. Secondary analysis of 2012 BRFSS

survey data, while providing a large, randomly-selected sample of veteran respondents, limited the scope of questions that could be asked about predictive variables and veteran depression. The sample was delimited to veterans not in institutions, homeless, or those who had already completed suicide attempts, potentially resulting in underrepresentation of depression rates in veterans by eliminating the most serious cases. Information on the specific treatment protocol depressed veterans may have undergone was not available using this data set. Data were self-reported, which could be problematic due to respondent recall or reluctance to answer sensitive, personal questions honestly. However, the use of self-report in survey-based research in the field is both accepted and common (Alvarez, Canduela, & Raeside, 2012).

The variables that presented such difficulty are those which come from questions asking about stigmatized behaviors like drinking and smoking. Missing data of any sort typically creates an underrepresentation issue that researchers must be mindful of in terms of variable limitation (Field, 2005). BRFSS respondents answered questions about their drinking and smoking behaviors that provided limited insight into whether habits like smoking and binge drinking can predict depression. The statistical usefulness of these variables was limited by the number of respondents who did not recall or refused to answer the questions about their usage, but data were present in sufficient numbers to render analysis possible. Initial frequencies showed 46.1% of the data were missing for the binge drinking variable ($n = 29,152$) and 37.5% were missing for smoking ($n = 33,767$).

Statistical experts disagree on the subject of data imputation for missing values; BRFSS data does not have a standardized or recommended imputation method due to weighting procedures utilized during data collection (Fahimi, 2007; Schneider, et al., 2012). Using list-wise deletion to eliminate non-responses, participants with missing values on the smoking and

drinking variable were omitted from analysis. Though this reduces power and introduces some level of under-representation bias, it does not create imputation bias risks (Fahimi, 2007). Estimates have shown that deletion results in a 7-9% underrepresentation issue, equal to that created by imputation (Frankel, et al., 2012). The present study relied on list-wise deletion for the variables of smoking and binge drinking, as resulting sample sizes were still sufficient for statistical analysis and results demonstrated significance. It is likely that the variables of binge drinking and smoking may be even more practically and statistically significant than the present study's results indicate (Frankel, et al., 2012).

Another limitation was the cross-sectional nature of this study's design, providing information from one snapshot in time from survey respondents. Such a design limited the conclusions that could be drawn, providing information about correlation, not direct causation. Some independent variables may be a result of depression as much as they may be a predictor of it. Cross-sectional research is respected and acceptable in the field, as it not only provides information about problem magnitude at a given survey point, but it is designed to go one step farther, to establish relationships between predictor variables and the health problem. Such research is commonly used as a baseline for health promoters designing programs (Lundberg, 2003).

Recommendations for Future Research

Gaining a better understanding of depression in the veteran population is vital to health promotion and education programming in the military community. The purpose of this study was to examine the relationship between ten key variables and rates of diagnosed depression and symptoms indicating undiagnosed depression in a national sample of veterans to generate

predictive models for the condition in military veterans. Results shed light on the association of demographic and behavioral health predictor variables on the conditions of diagnosed and symptoms which indicate undiagnosed depression; future research to improve intervention targeting is strongly encouraged, specifically with regard to variables that demonstrated some ambiguity in association (and in literature review) like race and ethnicity.

Understanding depression rates in the veteran community requires understanding warrior culture (CBS News, Mar 3, 2013; Malmin, 2013). Warrior culture, found in military and law enforcement settings, is characterized by a high degree of community insularity and antipathy towards displays of emotion or need (Bossarte, 2013; Hoge, 2012). The results of the present study indicate that a focus on specifically-targeted, asset-based resilience training may be more effective in reaching veterans than traditional models of patient care. A need exists for more studies that explore the attitudes, opinions, and beliefs of veterans towards programming focused on resilience-building. Research exploring these could improve the ability of interventions to result in healthier mental wellness outcomes for veterans and coincide with the desired drop in suicide rates.

The advancement of veteran mental health from a health promotion and education perspective could benefit tremendously from qualitative research, specifically case studies of successful resilience programming (Coughlin, 2012). This should involve rigorous program evaluation to evaluate culturally-sensitive content that focuses on predictor variables of interest, designing and validating program exemplars that provide the best opportunity to make a difference in the mental health of veterans.

Intervention timing should also be researched in the future through qualitative research and program evaluation efforts. The literature indicates that rather than focusing solely on post-

trauma treatment, resilience training can ameliorate the problem of stresses due to deployment before service (Jha, et al., 2010). The findings of the present study highlighted the sheer size of the treatment stigma problem. Resilience-training methods have been demonstrated to reduce stress and emotional reactivity and promote mental health and emotional well-being; framing this as promotion of combat fitness, resilience, and mental endurance may render it culturally-palatable to the military population (Greden, et al., 2010).

Summary

This chapter highlights the conclusions, implications for practice, recommendations for future research, and limitations of the present study. Based upon the results of the tested hypotheses, conclusions were drawn about the influence of predictor variables on depression in veterans, diagnosed and undiagnosed, leading to an increased understanding of the condition in this at-risk population. Practical significance findings and final models may expand understanding of the conditions of diagnosed and symptoms indicating undiagnosed depression in veterans. The limitations of this study were delineated. Finally, recommendations for future research described the need for additional research efforts as well as important directions to advance veteran health programming efforts.

Each of the identified predictors may be used in interventions aimed to improve veteran resilience and mental health and are amenable to modification. Information about odds ratios in univariate analysis may be of particular utility. Specifically, when targeting veteran populations already diagnosed with depression, the variables of sex, disability and pain, and beliefs about the usefulness of mental health care treatment are statistically significant and important to the

individual in terms of effect. When targeting veteran populations without depression diagnoses, the variables of ethnicity and disability and pain are statistically significant and important to the individual in terms of effect. Using information about significant predictors of depression in veterans to target programming is the first step; application of Resiliency Theory may be useful in rendering such targeted programs culturally-palatable in order to resonate with veterans who are used to operating within the social norms of warrior culture.

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