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Short Communication

Regional differences in BMI, obesity, and exercise frequency in a large veteran service organization: A secondary analysis of new veteran member surveys from Team Red, White & Blue

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ABSTRACT

The purpose of the present study was to examine regional differences in average self-reported BMI, obesity prevalence, and frequent exercise (FE) among members of Team Red, White, and Blue (Team RWB) – a military veteran service organization founded to increase physical activity in veterans. A total of 10,015 military veterans participated in a needs assessment conducted by Team RWB between December 2014 and August 2016. Multivariate regression analysis with bootstrapped coefficients revealed that: BMI was highest in the Midwest region (M = 28.282) of the United States, $F_{(20,\ 9882)} = 105.560$, $p < 0.001$; obesity prevalence was highest in the Southcentral (32.300%) and Southeast (32.200%) regions, $x^2_{(9731)} = 10{,}850$, $p < 0.001$; and FE was most prevalent in the Mid-Atlantic region (67.3%), $x^2_{(9882)} = 11{,}291$, $p < 0.001$.The results of this study closely mirror results found in studies of the general population. A better understanding of the geographic distribution of these outcomes could guide the targeting of sub-populations for public health programs. In particular, Team Red, White & Blue community growth and other fitness based public health programs could be expanded to reach more veterans.

1. Introduction

Obesity is a public health problem in the U.S. (Hedley et al., 2004). Although obesity rates in the active-duty military are lower than in the general population, veterans are at similar risk to civilians (Almond et al., 2008). In veterans and non-veterans, physical inactivity and poor diet are associated with obesity (Nelson, 2006). Among the general population, obesity varies by region – with the South and Midwest exhibiting the highest prevalence (Myers, 2015). Little is known about regional differences in obesity among veterans. The purpose of this study was to examine body mass index (BMI), obesity, and exercise frequency by region among military veterans who self-selected participation in a veterans' service organization. A better understanding of the geographic distribution of these outcomes could guide the targeting of sub-populations for public health programs. In particular, Team Red, White & Blue community growth and other fitness based public health programs could be expanded to reach more veterans. We explored the following non-directional, alterative hypotheses:

1. Military veteran BMI differs by region of the United States.
2. Military veteran obesity prevalence rates differ by region of the United States.

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3. Engagement in frequent exercise among military veterans differs by region of the United States.

2. Methods

2.1. Study design

Team RWB is a 501(c) organization focused on enriching veterans' lives through physical fitness and social activities to address re-integration challenges and offset physical health declines and weight gain following military to civilian transition (Angel et al., 2018). Since inception in 2010, Team RWB has grown to 209 chapters and 140,000 members, representing an intergenerational community of 70% veterans and 30% civilians (Team Red, White, and Blue, 2018a). The organization's reach is geographically-impactful and, in 2017, culminated in 24,939 exercise events, 6577 athletic events, 5633 social events, 2688 service events, and 7169 one-to-one member engagements (Team Red, White, and Blue, 2018b).

Team RWB staff collected baseline assessments of new members in 2014. Team RWB staff/researchers developed an instrument for the assessment. The instrument was reviewed by subject-matter experts and pilot-tested for completion time and psychometric properties. The final version of the online survey was offered to all new Team RWB members with a t-shirt incentive. Between December 2014–August 2016, 37,229 active-duty service-members, National Guard, reserve personnel, or veterans joined Team RWB. During this time-frame, 19,218 military-connected participants (52%) completed the survey. In this study, only veterans were analyzed (n = 10,015).

2.2. Dependent variables

Three dependent variables were examined: BMI, obesity (OB), and frequent exercise (FE). BMI was calculated with self-reported height and weight ($BMI = [(weight(lbs) / height(in))^2 * 703]$) (CDC, 2018). Three respondents exhibited BMIs < 5 and were, thus, discarded. OB was based on the NHLBI's guideline for BMI categories: BMIs ≥ 30 were coded as obese (NHLBI, 2018). FE was based on one Likert-scale item: "I exercise frequently." Response options included strongly disagree, disagree, neutral, agree, and strongly agree. "Strongly agree" and "agree" responses were coded as FE (Code = 1) while other responses were given a code of zero.

2.3. Independent variables

The primary independent variable was Team RWB region. Team RWB stratifies states into seven regions (Fig. 1): Northwest, Pacific, Southcentral, Midwest, Southeast, Mid-Atlantic, and Northeast. Respondents of the Team RWB survey were asked to provide their zip-code, which was used to code respondents into Team RWB regions (Team Red, White, and Blue, 2018a, 2018b).

2.4. Control variables

To isolate the effect of region on BMI, OB, and FE, and in keeping with other similar studies of veterans (Almond et al., 2008; Vieweg et al., 2006), several control variables were included. Items measuring race/ethnicity were omitted from the survey; therefore, we were unable to control for these factors. Gender was measured dichotomously (Female = 1, Male = 0). Employment status was measured with the following categories: employed, retired, disabled, and unemployed. Receipt of a "purple heart" – which was included as a proxy measure of previous traumatic experience – during military service was measured dichotomously (Yes = 1, No = 0). Use of Veterans Affairs (VA) healthcare benefits – which has been shown to be associated with higher BMI (Wang et al., 2012) – was measured dichotomously (Yes = 1, No = 0). Service era at the time of original entry – which served as a proxy for age – was measured with three categories: Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF), Gulf war, and Vietnam/Korean war.

One item assessed anxious mood: "In the past month, I have felt nervous, anxious, or on edge." One item assessed depressed mood: "In the past month, I have felt down, depressed, or hopeless." For these constructs, a five-point response scale was offered: strongly disagree to strongly agree. "Strongly agree" and "agree" responses were grouped together (Code = 1) and all other responses were grouped together (Code = 0). Survey completion year was also controlled for in the present study to rule out historical effects.

Daily tobacco use was measured with the following question: "How would you characterize your use of tobacco products?" The following response options were available: never, once a month or less, once a week or less, weekly, daily, and frequently during the day. "Daily" or "frequently during the day" responses were grouped together (Code = 1) and all other responses were grouped together (Code = 0). Daily alcohol use was measured with the following question: "How would you rate your consumption of alcohol?" The following response options were available: never, once a month or less, once a week or less, occasional drinks during the week, every day, and more than a couple drinks every day. Responses of "every day" or "more than a couple drinks every day" were grouped together (Code = 1) and all other responses were grouped together (Code = 0).

2.5. Data analysis

Descriptive statistics for BMI, OB and FE were calculated according to the independent and control variables. Maps were created in QGIS (Quantum GIS Development Team, 2018) in order to visually represent regional differences in BMI, OB, and FE. Three regression models were estimated in this study. Robust linear regression with M-estimation was used to examine the effect of region on BMI (Huber, 1981). Maximum likelihood logistic regression (Hosmer and Lemeshow, 2005) was used to examine (a) the effect of region on OB, and (b) the effect of region on FE. The control variables listed earlier in this paper were included in all models. Beta coefficients in all models were bootstrapped with 1999 resamples (Shorack, 1982) and bias-corrected 95% confidence intervals were generated for each estimate (DiCiccio and Romano, 1988). Effect sizes (Cohen, 1988) were calculated for pairwise regional differences in BMI (Cohen's d), OB (Cohen's h), and FE (Cohen's h) based on significant results of the regression models.

3. Results

Average BMI was highest in the Midwestern region (Table 1, Fig. 1), while the lowest average BMI was evident in the Pacific region; however, results showed that all regions had an average BMI within the overweight BMI category, as established by the U.S. Department of Health and Human Services (NHLBI, 2018). Obesity prevalence was highest in the Southcentral and Southeast regions (Fig. 1). The Pacific region had the lowest proportion of obesity. FE was most common in the Mid-Atlantic region, while FE was least common in the Northeast (Fig. 1).

The overall BMI model (Table 2) was statistically significant, $F_{(20, 9882)} = 105.560$, $p < 0.001$. Veterans in the Northeastern, Southeastern, Midwestern, and Southcentral regions had significantly higher BMIs than veterans in the Pacific region. Cohen's d was calculated for the aforementioned statistically significant regional differences in order to determine the practical difference in means: Midwest vs. Pacific, $d = 0.139$; Southeast vs. Pacific, $d = 0.128$; Southcentral vs. Pacific, $d = 0.127$; and Northeast vs. Pacific, $d = 0.084$. Covariates associated with higher BMI included being male, having VA health care benefits, exercising infrequently, reporting symptoms consistent with depressed mood, not using alcohol/cigarettes daily, having served in the Gulf/Vietnam/Korean war eras, and being disabled.