Outcome by Gender in the Veterans Health Administration Motivating Overweight/Obese Veterans Everywhere Weight Management Program

Bryan C. Batch, MD, MHS,¹ Karen Goldstein, MD, MSPH,^{2,3} William S. Yancy, Jr., MD, MHS,²⁻⁴ Linda L. Sanders,³ Susanne Danus,² Steven C. Grambow, PhD,⁵ and Hayden B. Bosworth, PhD^{2,3,6}

Abstract

Background: Few evaluations of the Veterans Health Administration Motivating Overweight/Obese Veterans Everywhere (MOVE!) weight management program have assessed 6-month weight change or factors associated with weight change by gender.

Materials and Methods: Analysis of administrative data from a national sample of veterans in the VA MOVE! program.

Results: A total of 62,882 participants were included, 14.6% were women. Compared with men, women were younger (49.6 years [standard deviation, SD, 10.8] vs. 59.3 years [SD, 9.8], $p < 0.0001$), less likely to be married (34.1% vs. 56.0%, $p < 0.0001$), and had higher rates of post-traumatic stress disorder (26.0% vs. 22.4%, $p < 0.0001$) and depression (49.3% vs. 32.9%, $p < 0.001$). The mean number of MOVE! visits attended by women was lower than men (5.6 [SD, 5.3] vs. 6.0 [SD, 5.9], $p < 0.0001$). Women, compared with men, reported lower rates of being able to rely on family or friends (35.7% vs. 40.8%, $p < 0.0001$). Observed mean percent change in weight for women was -1.5% (SD, 5.2) and for men was -1.9% (SD, 4.8, $p < 0.0001$). The odds of $\geq 5\%$ weight loss were no different for women (body-mass index [BMI] $> 25 \text{ kg/m}^2$) compared with men (BMI $> 25 \text{ kg/m}^2$; odds ratio, 1.05 [95% confidence interval, 0.99–1.11; $p = 0.13$]).

Conclusions: Women veterans lost less weight overall compared with men. There was no difference in the odds of achieving clinically significant weight loss by gender. The majority of women and men enrolled lost $< 5\%$ weight despite being enrolled in a lifestyle intervention. Future studies should focus on identifying program- and participant-level barriers to weight loss.

Keywords: obesity, veteran, women's health

Introduction

THE NUMBER OF women veterans using Veterans Health Administration services doubled in the past decade.¹ Women veterans are $\sim 7.7\%$ of the veteran population and are expected to make up 14.3% of the total veteran population by 2033.¹ Despite being younger, on average, than men, 37.4% of women veterans are obese compared with 32.9% of men veterans.² For men and women, obesity is associated

with increased risk of hypertension and diabetes.³ For every 1 kg weight gained, the risk of diabetes mellitus (DM) increases by 4.5%–9%.³

Clinically significant weight loss, defined as 5%–10% loss, has the potential to mitigate complications associated with obesity.⁴ The current obesity guidelines recommend screening for overweight/obesity and referral, for participants at risk, to an intensive behavioral weight loss intervention.⁵ One such program developed and implemented by the VA is

¹Division of Endocrinology, Metabolism, and Nutrition, Department of Medicine, Duke University Medical Center, Durham, North Carolina.

²Center for Health Services Research in Primary Care, Durham VA Medical Center, Durham, North Carolina.

³Division of General Internal Medicine, Department of Medicine, Duke University Medical Center, Durham, North Carolina.

⁴Duke University Diet and Fitness Center, Duke University Health System, Durham, North Carolina.

⁵Department of Biostatistics and Bioinformatics, Duke University Medical Center, Durham, North Carolina.

⁶Department of Psychiatry and Behavioral Sciences, School of Nursing, Duke University, Durham, North Carolina.

the Motivating Overweight/Obese Veterans Everywhere (MOVE!) program. MOVE! is an evidence-based multidisciplinary approach to weight management. The program focuses on dietary modification and key behavioral strategies (*i.e.*, goal setting, action planning, and relapse prevention) that have been shown to be associated with successful weight loss.⁶

Evaluations of the MOVE! program demonstrate that women veterans are disproportionately more likely to participate in MOVE!, considering they represent 14% of MOVE! enrollees, but are <10% of the veteran population.^{6,7} However, few studies have evaluated national MOVE! weight loss outcomes by gender. This lack of gender comparison persists despite a growing body of evidence that women veterans, compared with civilian women and with men veterans, are more likely to have personal characteristics such as low levels of social support that are associated with poor response to weight loss interventions. For example, women veterans are less likely than men veterans to be married (52.5% vs. 22.1%), more likely to live alone (15.1% vs. 9.6%), and less likely to have someone to take them to the doctor.^{8,9} Since social support is associated with positive weight loss outcomes,¹⁰ lower levels of social support for women veterans could be associated with less favorable weight outcomes for women in the MOVE! program.^{10,11}

The presence and treatment of comorbid psychiatric disorders such as post-traumatic stress disorder (PTSD) and depression are also associated with obesity and difficulty with weight loss¹² and are more common in women than men.⁹ Twenty-three percent of women veterans experience depression versus 17% of men veterans.¹³ In addition, 21% of women veterans of Operation Enduring Freedom/Operation Iraqi Freedom experience PTSD.¹⁴ Depression and PTSD are associated with poor coping strategies such as emotional eating, bingeing, and purging that can be barriers to positive behavior change and lead to poor health outcomes.^{9,15,16}

The goals of the current analyses were to determine patterns of change in weight over 6 months in women and men enrolled in the MOVE! program. We also sought to characterize gender differences in baseline demographic and psychosocial factors associated with weight loss. Ultimately, identification of potentially modifiable factors could inform the design of future weight loss interventions for women veterans.

Materials and Methods

The current analyses utilized national data from the VA MOVE! program between January of 2008 and February of 2013. The study was approved by the Durham VA Medical Center's institutional review board.

Overview of MOVE!

The MOVE! program is an evidence-based lifestyle program that provides counseling on changing lifestyle to improve nutrition and increase physical activity. Participants qualified for the program if they have a body-mass index (BMI) ≥ 30 kg/m² or a BMI of 25–30 kg/m² with one or more obesity-related conditions listed in the electronic medical record (*e.g.*, diabetes, hypertension, dyslipidemia, sleep apnea, metabolic syndrome, or arthritis). The goals of the MOVE! program include modifying diet and increasing

physical activity (150–300 minutes/week) to achieve at least a 5%–10% weight loss. Participants who enrolled in the MOVE! program between 2008 and 2013 could choose from one of three programs: MOVE! Groups, Telephone Lifestyle Coaching (TLC), and TeleMOVE! program. The MOVE! group sessions are the most common way veterans participate in the MOVE! program. Groups that are clinician led meet on a regular basis (typically once a week). The groups are structured to follow a prespecified format. Veterans can also elect to participate in TLC. TLC involves frequent, scheduled one-on-one telephone calls with a weight management coach. Last, veterans can elect to participate in the TeleMOVE! program. This program includes the use of home messaging technology that sends frequent reminders to facilitate veterans achieving their weight management goals. Clinician contact is available as needed. Typically, veterans are not allowed to be enrolled in both in-person and TLC or TeleMOVE! concurrently.

Before participating in the MOVE! program, participants completed an entry survey. This survey gathers key baseline information about medical history, weight and weight management history, psychosocial factors, and frequency and type of physical activity.

As part of the curriculum, staff review participant-specific reports generated from the survey with participants and provide personalized handouts on nutrition, physical activity, and healthy behavior change based on each participant's responses. Staff also helped participants set goals to change their diet and physical activity at the first visit. Follow-up visits after the initial visit are provided *via* in-person group visits, over the phone or one-on-one.

Although programs at each site are based on national MOVE! guidelines, each site is required to use their own resources to implement the MOVE! program, hence there are variations in implementation across sites. Staff who implement the program, the types of programming available, and adjunct treatments offered (*i.e.*, medication and bariatric surgery) can vary by site.

Defining the cohort

All participants included in the cohort completed a baseline MOVE!23 survey. The baseline date for the analysis was defined as the first MOVE! visit within 31 days of the survey date. Additional inclusion criteria included a baseline BMI ≥ 25 kg/m², at least one weight measurement available at baseline and at 5–6 months after baseline, and at least one MOVE! visit after the baseline visit. Participants with incomplete survey data for the variables of interest were excluded. Participants with a history of bariatric surgery or on weight loss medications were not excluded from the cohort.

Measures

Weight. Weight in pounds was obtained from the VA Corporate Data Warehouse (CDW) vital signs record. All weights between the baseline visit and 5–6 months after the baseline visit were extracted. We utilized a multistage outlier detection algorithm developed by Maciejewski et al.¹⁷ to clean the weight data, removing clinically implausible weight entries occurring on the same day or weights that substantially deviated from plausible trends over time. This algorithm resulted in the exclusion of a small proportion (4.4%,

$n=382,839$) of 8,766,801 weight measurements. BMI was calculated as weight (kg)/height (m^2).

Baseline characteristics and site

All variables, with exception of the MOVE!23 survey data, were obtained from the VA CDW. The MOVE!23 survey data were obtained through a data use agreement with the VA National Center for Health Promotion and Disease Prevention (NCP).

MOVE! visits

MOVE! visits (in person or telephone) were identified as any visit associated with stop code 372 or 373. Stop codes are methods for identifying the type of visit completed within the VA healthcare system.

Comorbidities

ICD-9 codes were used to define the presence of diabetes, hypertension, PTSD, or depression.

MOVE!23 survey

The MOVE!23 survey is a web-based, 23-item baseline assessment that gathers information about medical history, weight loss history, and behaviors that potentially lead to obesity or serve as barriers to changing lifestyle and increasing physical activity. The survey also explores motivation to lose weight, readiness to change, and confidence in changing behaviors.⁶ The survey was created as a clinical tool, and a seventeen-item subscale of the survey—perceived contributors to weight change (PCWC)—is a validated and reliable measure.¹⁸ Within the subscale, the five-item psychosocial factor (*i.e.*, eating because of emotions or stress, family/relationship problems, boredom, loneliness, and feeling bad about myself) has been shown to have consistent internal validity and good internal consistency.¹⁸ The current analysis included items from the psychosocial factor of the PCWC subscale as well as other self-reported characteristics (perceived social support, importance of losing weight, and self-efficacy) that have been shown to be associated with successful behavior change and weight loss.^{19,20}

Statistical analyses

Descriptive analyses. Descriptive statistics were used to summarize all study variables. For continuous variables, means and standard deviations (SDs) were generated, and for categorical variables, frequencies and percents for characteristics were generated. We used two-sample *t*-tests (continuous outcomes) or Pearson chi-square tests (categorical outcomes) to informally compare characteristics between men and women and gauge potential imbalances between groups at baseline.

Primary analyses. The primary outcome was percent change in weight dichotomized as $<5\%$ or $\geq 5\%$. Five percent was used as a cutoff because the national obesity guidelines support this level as the lower limit of weight loss thought to be clinically significant.⁵

Logistic regression was used to model the effect of gender and other baseline factors on the probability that weight loss

over a 6-month period was $\geq 5\%$ or $>10\%$. The covariates included in the model were gender, race, age, marital status, diagnosis of depression, diagnosis of PTSD, total number of MOVE! visits, self-reported level of social support, importance of weight control, confidence in changing diet and physical activity, psychosocial factors from the PCWC scale on the MOVE!23 survey, and region of the United States in which the MOVE! program attended was located (defined as West, Northeast, Midwest, South). Region was included in the model to reduce confounding that may result from broad regional variations in program implementation across the nation.²¹ The covariates included were chosen because they are known to be associated with BMI or weight loss in veteran and nonveteran populations or prior data support a potential association with BMI or weight. Effects of multicollinearity were examined using variance inflation factors.

Results

Baseline characteristics

The cohort included 62,882 participants, of which 14.6% were women. The mean age of women was ~ 10 years younger than men (49.6 [SD, 10.8] vs. 59.3 [SD, 9.8], $p<0.0001$). Approximately 25% of the participants were African American and 4.6% were Hispanic. (Table 1) The mean BMI for men was 36.2 (SD, 6.6) and for women was 35.4 (SD, 6.5, $p<0.0001$). Rates of hypertension (76.2% vs. 49.7%, $p<0.0001$) and diabetes (48.0% vs. 24.4%, $p<0.0001$) were higher in men compared with women. Rates of depression (49.3% vs. 32.9%, $p<0.0001$) and PTSD (26.0% vs. 22.4%, $p<0.0001$) were higher in women versus men. The mean number of MOVE! visits attended by men was higher than by women (6.0 [SD, 5.9] vs. 5.6 [SD, 5.3], $p<0.0001$) (Table 1).

Baseline characteristics for gender subgroups within weight loss categories

Women who lost $\geq 5\%$ of their body weight, compared with men who lost $\geq 5\%$ of their body weight, were younger (49.9 [SD, 10.9] vs. 59.9 [SD, 9.6], $p<0.0001$), more racially diverse (69.2% white vs. 82.0% white, $p<0.0001$), had a lower baseline BMI (33.0 [SD, 6.1] vs. 34.1 [SD, 6.2], $p<0.0001$), had a lower rate of being married (36.1% vs. 57.6%), and attended fewer MOVE! visits (7.5 [SD, 6.2] vs. 7.9 [SD, 6.7], $p=0.010$). Comparisons of baseline demographics for women who lost $<5\%$ of their weight versus men who lost $<5\%$ of their weight were similar to comparisons of men and women at baseline who lost $\geq 5\%$ of their weight (Table 2).

Results of MOVE!23 survey

Of MOVE! program participants who completed the MOVE!23 survey, 40.8% of men versus 35.7% of women endorsed being able to rely on their family or friends for support or encouragement as “a lot” ($p<0.0001$). Both men and women rated the importance of controlling weight to them personally as “very important” (men 9.0 [SD, 1.6] of 10, women 8.5 [SD, 1.9] of 10, 10 defined as very important, $p<0.0001$). Men, compared with women, were more confident about changing behaviors around diet and physical activity (7.3 [SD, 2.4] of 10 vs. 7.1 [SD, 2.5] of 10, 10 defined as very confident, $p=0.0002$). More women, compared with men, reported the following reasons for being overweight: eating

TABLE 1. BASELINE CHARACTERISTICS OVERALL AND BY GENDER

<i>Baseline characteristics</i>	<i>Overall n = 62,882</i>	<i>Women n = 9160</i>	<i>Men n = 53,722</i>	<i>p^a</i>
Age, mean (SD)	57.9 (10.5)	49.6 (10.8)	59.3 (9.8)	<0.0001
White	47,046 (74.8)	5622 (61.4)	41,424 (77.1)	<0.0001
Ethnicity	2906 (4.6)	443 (4.8)	2463 (4.6)	0.272
Hispanic				
Not Hispanic	56,522 (89.9)	8200 (89.5)	48,322 (89.9)	
Refused/unknown	3454 (5.5)	517 (5.6)	2937 (5.5)	
Married	33,212 (52.8)	3120 (34.1)	30,092 (56.0)	<0.0001
Unknown	303 (0.5)	54 (0.6)	249 (0.5)	
Weight (lbs.), mean (SD)	251.1 (51.6)	214.6 (41.3)	257.3 (50.6)	<0.0001
Lost ≥5% by 5–6 months	13,337 (21.2)	1866 (20.4)	11,471 (21.4)	
BMI, mean (SD)	36.8 (6.6)	36.0 (6.4)	36.9 (6.6)	<0.0001
Geographic area	10,569 (16.8)	1488 (16.2)	9081 (16.9)	<0.0001
West				
Northeast	10,423 (16.6)	1244 (13.6)	9179 (17.1)	
Midwest	15,061 (24.0)	1800 (19.7)	13,261 (24.7)	
South	26,820 (42.7)	4627 (50.5)	22,193 (41.3)	
Unknown	9 (0.0)	1 (0.0)	8 (0.0)	
Hypertension	45,502 (72.4)	4556 (49.7)	40,946 (76.2)	<0.0001
Depression	22,190 (35.3)	4518 (49.3)	17,672 (32.9)	<0.0001
Diabetes	28,014 (44.6)	2237 (24.4)	25,777 (48.0)	<0.0001
PTSD	14,424 (22.9)	2382 (26.0)	12,042 (22.4)	<0.0001
Total MOVE! visits, mean (SD)	6.0 (5.8)	5.6 (5.3)	6.0 (5.9)	<0.0001

Unless otherwise specified, *n* (%) with characteristic shown.

^a*p*-Values were derived using chi-squared test for categorical variables and the two-sample *t*-test for continuous variables.

BMI, body-mass index; MOVE!, Motivating Overweight/Obese Veterans Everywhere; PTSD, post-traumatic stress disorder; SD, standard deviation.

TABLE 2. BASELINE CHARACTERISTICS OF GENDER SUBGROUPS WITHIN DICHOTOMIZED WEIGHT LOSS CATEGORIES

<i>Baseline characteristic</i>	<i>Overall n = 62,882</i>	<i>Lost ≥5%</i>		<i>p</i>	<i>Lost <5%</i>		<i>p^a</i>
		<i>Women n = 1866</i>	<i>Men n = 11,471</i>		<i>Women n = 7294</i>	<i>Men n = 42,251</i>	
Age, mean (SD)	57.9 (10.5)	49.9 (10.9)	59.9 (9.6)	<0.0001	49.5 (10.7)	59.1 (9.9)	<0.0001
White	47,046 (74.8)	1292 (69.2)	9405 (82.0)	<0.0001	4330 (59.4)	32,019 (75.8)	<0.0001
Ethnicity				0.543			0.376
Hispanic	2906 (4.6)	76 (4.1)	434 (3.8)		367 (5.0)	2029 (4.8)	
Not Hispanic	56,522 (89.9)	1687 (90.4)	10,408 (90.7)		6513 (89.3)	37,914 (89.7)	
Refused/unknown	3454 (5.5)	103 (5.5)	629 (5.5)		414 (5.7)	2308 (5.5)	
Married	33,212 (52.8)	673 (36.1)	6613 (57.6)	<0.0001	2247 (33.5)	23,479 (55.6)	<0.0001
Unknown	303 (0.5)	7 (0.4)	47 (0.4)		47 (0.6)	202 (0.5)	
Weight, mean (SD)	251.1 (51.6)	215.4 (41.9)	260.4 (51.4)	<0.0001	214.4 (41.2)	256.4 (50.3)	<0.0001
BMI, mean (SD)	36.8 (6.6)	36.2 (6.5)	37.4 (6.8)	<0.0001	35.9 (6.4)	36.8 (6.6)	<0.0001
Geographic area				<0.0001			<0.0001
West	10,569 (16.8)	347 (18.6)	2110 (18.4)		1141 (15.6)	6971 (16.5)	
Northeast	10,423 (16.6)	261 (14.0)	1991 (17.4)		983 (13.5)	7188 (17.0)	
Midwest	15,061 (24.0)	415 (22.2)	2968 (25.9)		1385 (19.0)	10,293 (24.4)	
South	26,820 (42.7)	843 (45.2)	4400 (38.4)		3784 (51.9)	17,793 (42.1)	
Unknown	9 (0.0)	0	2 (0.0)		1 (0.0)	6 (0.0)	
Hypertension	45,502 (72.4)	875 (46.9)	8554 (74.6)	<0.0001	3681 (50.5)	32,392 (76.7)	<0.0001
Depression	22,190 (35.3)	897 (48.1)	3531 (30.8)	<0.0001	3621 (49.6)	14,141 (33.5)	<0.0001
Diabetes	28,014 (44.6)	383 (20.5)	4836 (42.2)	<0.0001	1854 (25.4)	20,941 (49.6)	<0.0001
PTSD	14,424 (22.9)	470 (25.2)	2298 (20.0)	<0.0001	1912 (26.2)	9744 (23.1)	<0.0001
Total MOVE! visits, mean (SD)	6.0 (5.8)	7.5 (6.2)	7.9 (6.7)	0.010	5.2 (4.9)	5.5 (5.6)	<0.0001

Unless otherwise specified, *n* (%) with characteristics shown. Percentages might not sum to 100 due to rounding.

^a*p*-Values were derived using chi-squared test for categorical variables and the two-sample *t*-test for continuous variables.

TABLE 3. MOTIVATING OVERWEIGHT/OBESE VETERANS EVERYWHERE!23 SURVEY RESULTS FOR GENDER SUBGROUPS

<i>Baseline survey results</i>	<i>Overall n = 62,882</i>	<i>Women n = 9160</i>	<i>Men n = 53,722</i>	<i>p^a</i>
Social support	25,185 (40.1)	3270 (35.7)	21,915 (40.8)	
Rely A LOT on family/friends				<0.0001
Rely SOMEWHAT/NOT AT ALL on family/friends	37,697 (59.9)	5890 (64.3)	31,807 (59.2)	<0.0001
How important is controlling your weight to you personally? Mean (SD) (0–10, 10= Very)	8.6 (1.9)	8.5 (1.9)	9.0 (1.6)	<0.0001
How confident are you that you can successfully change your eating and physical activity to control your weight? Mean (SD) (0–10, 10= Very)	7.2 (2.4)	7.3 (2.4)	7.1 (2.5)	0.0002
Reasons for being overweight				
Eating because of emotions or stress	25,810 (41.0)	5437 (59.4)	20,373 (37.9)	<0.0001
Family or relationship problems	10,686 (17.0)	2514 (27.4)	8172 (15.2)	<0.0001
Boredom	22,645 (36.0)	3700 (40.4)	18,945 (35.3)	<0.0001
Loneliness or loss of loved one	10,116 (16.1)	2349 (25.6)	7767 (14.5)	<0.0001
Feeling bad about myself	11,931 (19.0)	2676 (29.2)	9255 (17.2)	<0.0001

Data derived from MOVE!23 questions 8, 9, 10, and 14a–d, j. Unless otherwise specified, *n* (%) with characteristics shown.

^a≥*p*-Values were derived using chi-squared test for categorical variables and the two-sample *t*-test for continuous variables.

because of emotions/stress (59.4% vs. 37.9%, $p < 0.0001$), family or relationship problems (27.4% vs. 15.2%, $p < 0.0001$), boredom (40.4% vs. 35.3%, $p < 0.0001$), loneliness or loss of loved one (25.6% vs. 14.5%, $p < 0.0001$), and feeling bad about myself (29.2% vs. 17.2%, $p < 0.0001$) (Table 3).

Weight change

Observed mean weight change overall was -2.2 kg (SD, 5.8). Mean weight change for men was -2.3 kg (SD, 5.9) and for women was -1.5 kg (SD, 5.1) ($p < 0.0001$). Mean percent change in weight overall was -1.9 (SD, 4.9), for men was -1.9 (SD, 4.8), and for women was -1.5 (SD, 5.2) ($p < 0.0001$). A similar percentage of men and women composed the MOVE! program participants who lost $\geq 5\%$ of their weight (21.4% vs. 20.4%, respectively). There was no significant difference in the odds of losing $\geq 5\%$ weight for women versus men (odds ratio [OR] 1.05 [95% confidence interval, CI, 0.99–1.11; $p = 0.13$]). In addition, there was no significant difference in the odds of losing $>10\%$ weight for women versus men (data not shown).

We also evaluated the odds of losing $\geq 5\%$ weight for women versus men in the overweight, class I obesity (BMI >30 , <35), class II obesity (BMI >35 , <40), and class III obesity (BMI ≥ 40) categories. There was no significant difference in the odds of losing $\geq 5\%$ for women versus men in the overweight, class II obesity and class III obesity categories. However, there was a significant difference in the odds of losing $\geq 5\%$ for women versus men in the class I obesity category (OR 1.31 [95% CI 1.01–1.25; $p = 0.02$]). Last, the variable with the largest OR was race. There was a significant difference in the odds of losing $\geq 5\%$ weight for whites versus blacks (OR 1.46 [95% CI 1.39–1.54; $p < 0.0001$]) (Table 4).

Race by sex, PTSD by sex, and depression by sex interaction terms were each added to the multivariable model, but all were found to be nonsignificant. We also explored interaction terms for sex by each of the reasons for being overweight and found all to be nonsignificant as well. Thus, no interaction terms were included in the final model. No multicollinearity among the covariates in the model was observed. Last, as a sensitivity analysis, we expanded the cohort

to include participants with a baseline visit within 60 days of their survey date and final weight within 5–8 months of their baseline date; we observed similar results.

Discussion

The results of the current analyses demonstrate that although women lost less weight than men, there was no difference in the odds of losing a clinically significant amount of weight ($\geq 5\%$) for women versus men in the overall (BMI >25), overweight, class II obesity or class III obesity categories. However, there was a significant difference in the odds of losing $\geq 5\%$ for women versus men in the class I obesity category and for whites versus blacks. To our knowledge, our analysis is the first to evaluate the probability of achieving clinically significant weight loss by gender in a national cohort enrolled in the MOVE! program.

Prior evaluations of the effectiveness of the MOVE! program show similar rates of clinically significant weight loss when compared with our results. For example, an analysis by Kahwati et al. showed that 18.6% of participants who participated in at least two MOVE! visits achieved at least 5% body weight loss at 6 months.²² This is compared with our results, which demonstrate that 21% of participants who participated in at least one MOVE! visit achieved at least 5% body weight loss at 6 months.

Our results are also consistent with those from a study by Garvin et al. that sought to determine participant- and program-level characteristics associated with greater than or equal to 5% weight loss for 404 MOVE! participants at the Charlie Norwood Veterans Administration Medical Center. Results demonstrate that gender was not a predictor of achieving greater than 5% weight loss (OR, 0.65 [95% CI, 0.30–1.45], $p = 0.30$).²³

Our results differ from Littman et al. who evaluated the effectiveness of the MOVE! program in 8 of 20 VISN facilities in Alaska, Idaho, Oregon, and Washington State²⁴; 951 women and men were included in the analysis at 6 months. The results showed that women had a lower likelihood of $>5\%$ weight loss compared with men. The difference

TABLE 4. MULTIVARIABLE LOGISTIC REGRESSION SHOWING CHARACTERISTICS ASSOCIATED WITH $\geq 5\%$ WEIGHT LOSS

	<i>Model estimates</i>		
	<i>OR</i>	<i>95% CI</i>	<i>p</i>
White (vs. black)	1.46	1.39–1.54	<0.0001
Women (vs. men)	1.05	0.99–1.11	0.135
Age	1.00	1.00–1.00	0.959
Married (vs. not)	1.05	1.00–1.09	0.036
Region (WE vs. SO)	1.08	1.02–1.15	0.004
Region (NE vs. SO)	0.99	0.93–1.04	0.0059
Region (MW vs. SO)	1.03	0.98–1.08	0.855
Depressed (vs. not)	0.95	0.91–1.00	0.023
PTSD (vs. not)	0.88	0.83–0.92	<0.0001
Total MOVE!23 visits	1.06	1.06–1.06	<0.0001
Rely A LOT on family/friends (vs. SOMEWHAT/NOT AT ALL)	1.03	1.00–1.08	0.110
How important is controlling your weight (0–10)	1.04	1.03–1.05	<0.0001
How confident are you that you can successfully change your eating and physical activity? (0–10)	1.02	1.01–1.03	<0.001
Eating because of emotions or stress (checked vs. not)	0.98	0.93–1.02	0.322
Family or relationship problems (checked vs. not)	0.94	0.88–1.00	0.045
Boredom (checked vs. not)	1.02	0.98–1.07	0.342
Loneliness or loss of loved one (checked vs. not)	0.97	0.91–1.04	0.407
Feeling bad about myself (checked vs. not)	1.03	0.97–1.09	0.350

The multivariable logistic regression model was specified *a priori* and included the effects of race, sex, age, marital status, geographic region (West, Northeast, Midwest, South), diagnosis of depression, diagnosis of PTSD, total number of MOVE! visits, self-reported level of social support, importance of weight control, confidence in changing diet and physical activity, and psychosocial factors from the PCWC scale on the MOVE!23 survey.

CI, confidence interval; MW, Midwest; NE, Northeast; OR, odds ratio; PCWC, perceived contributions to weight change; SO, South; WE, West.

in results for this study compared with the current analysis could be related to inclusion of a smaller cohort (951 vs. 68,882) and significant heterogeneity in implementation of the program at these eight facilities in four states (Alaska, Idaho, Oregon, and Washington State) in the same region of the country. This is in contrast to our analysis, which included data from states across every region of the country.

A systematic review of translational research on the Diabetes Prevention Program (DPP) provides some data to compare civilian community-based effectiveness programs with our VA cohort.²⁵ Sixteen studies were included and varied considerably in study design, setting, length of follow-up, and sample size. Compared with our analysis, the mean age (51.7 years) was younger, but baseline BMI (36.5 kg/m²) was similar. Unlike our cohort, the majority of participants were women (55%–90%). Although the most effective translations of the DPP demonstrated higher prevalence of clinically significant weight loss than the current analysis, the percent of men and women in our analysis who were able to lose $\geq 5\%$ weight is comparable with weight loss achieved in similarly designed programs for civilian populations. For example, Matvienko et al.²⁵ demonstrated that 39% of participants in a community-based DPP lost $\geq 5\%$ of their baseline weight. In addition, results from a recent qualitative evaluation of women veteran's experience with a web-based DPP demonstrated that women participants lost 5.24% of baseline weight.²⁶

A recent analysis by Vimalananda et al. explored 12-month weight change by gender for 481 participants in the ASPIRE weight loss trial.²⁷ The ASPIRE program used a novel small-changes approach that encouraged participants to make small but cumulative changes in nutrition and physical activity. Results show that at 12 months, women lost

statistically significant weight from baseline in the ASPIRE-Group (–2.6%) and MOVE! program (–2.7%), but not the ASPIRE-Phone group (+0.2%). In contrast, men lost significant weight in all arms (ASPIRE-Phone group, –1.5%; ASPIRE-Group, –2.5%; MOVE! program, –1.0%) at 12 months. There remains a lack of understanding regarding how to achieve clinically significant weight loss for most women veterans.

It is notable that the majority of women (80%) and men (79%) included in the current analyses lost a clinically insignificant (<5%) amount of weight over 6 months. MOVE! program was initially developed to be a high-intensity, primarily in-person weight management program. However, because of low enrollment, the VA has invested in increasing the reach of the MOVE! program by adding telephonic coaching, in-home telephone messaging technologies, and smartphone applications. Increasing reach and effectiveness of the MOVE! program for all veterans is a key priority for the VA. One way to improve effectiveness is to focus on increasing engagement and attendance for all veterans enrolled.

Attendance at intervention sessions has been repeatedly shown to be a predictor of weight loss.^{7,23,28} Our results show that women attended significantly fewer sessions than men. Increasing attendance at counseling sessions could potentially enhance weight loss outcomes for women veterans. Recent results from a qualitative analysis focused on women veterans in a web-based DPP support the important role that convenience, integration of the program with daily life, and flexibility play in attendance and engagement in the program.²⁶ It is possible that difficulty with attending MOVE! program is secondary to lack of social support and high levels of disability and comorbid psychiatric disease—both issues

that disproportionately affect women veterans.²⁶ However, our results demonstrate that when interactions of sex by depression and PTSD were added to the multivariable model, they were each found to be nonsignificant. Future research is needed to better define tools for assessment of barriers to attendance that are specific to women and men veterans.

One possible way to potentially increase the effectiveness of MOVE! program for women veterans is to address poor coping strategies such as emotional eating, overeating, and isolation that encourage obesity and reinforce a lack of social support and engagement. These factors were more commonly identified by women than men in our study. A study by Mattocks et al. provides insight into common coping strategies of 19 women veterans who participated in Operation Enduring Freedom/Operation Iraqi Freedom.⁹ Examples of negative coping mechanisms included emotional eating, overeating and bingeing, and purging. It is possible that teaching positive coping skills has the potential to facilitate positive behavior change and weight loss.

The limitations of our study include a lack of generalizability of the results to the civilian population or the VA population that does not consistently use the VA for their care or are dual users (utilize VA and non-VA services). In addition, there is potential that in defining the cohort, we may have lost participants who were enrolled in the program, but were less engaged, or included a small number of participants who had bariatric surgery, were on weight loss medication, or were pregnant. The small number of individuals referred for weight loss surgery within VA, lack of access to the majority of weight loss medications, and mean age of the population make inclusion of individuals in any of the three cohorts less likely. The most common reasons for exclusion from the final cohort included lack of a visit within a month of the baseline visit (*i.e.*, only one MOVE! visit), lack of weight data at baseline or at 5–6 months' follow-up, and incomplete survey data. The level of exclusion due to missing data in our cohort is comparable with a prior evaluation of the MOVE! program.²⁴ Last, there may be other unknown factors that could influence response to the MOVE! program that were not assessed or included in the analysis.

The strengths of the current analysis are inclusion of a national sample of veterans, the size of the cohort, and the ethnic/racial and geographic diversity of the sample. In addition, the use of clinical data allows for more realistic translation of results into clinical practice.

Conclusions

The results of this analysis show that 21.4% of men veterans and 20.4% of women veterans lost a clinically significant amount of their weight ($\geq 5\%$) after 6 months of enrollment in the MOVE! program. The likelihood of losing a clinically significant amount of weight ($\geq 5\%$) was not significantly different for women versus men in the overall (BMI > 25), overweight, class II obesity or class III obesity categories after controlling for various factors. However, there was a statistically significant difference in the odds of losing $\geq 5\%$ for women versus men in the obesity class I category and for whites versus blacks. Achieving clinically significant weight loss for all veterans is critical because of the association of obesity with significant morbidity, mortality, and higher cost of care. Future studies need to explore ways to engage women and

men veterans of diverse backgrounds in lifestyle interventions targeted to the specific needs of each group.

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References

1. Yano EM, Hayes P, Wright S, et al. Integration of women veterans into VA quality improvement research efforts: What researchers need to know. *J Gen Intern Med* 2010;25 Suppl 1:56–61.
2. Das SR, Kinsinger LS, Yancy WS, Jr., et al. Obesity prevalence among veterans at Veterans Affairs medical facilities. *Am J Prev Med* 2005;28:291–294.
3. Dalle Grave R, Centis E, Marzocchi R, et al. Major factors for facilitating change in behavioral strategies to reduce obesity. *Psychol Res Behav Manag* 2013;6:101–110.
4. Knowler WC, Barrett-Connor E, Fowler SE, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med* 2002;346:393–403.
5. Jensen MD, Ryan DH, Apovian CM, et al. 2013 AHA/ACC/TOS guideline for the management of overweight and obesity in adults: A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the Obesity Society. *Circulation* 2014;129:S102–S138.

6. Kinsinger LS, Jones KR, Kahwati L, et al. Design and dissemination of the MOVE! Weight-Management Program for veterans. *Prev Chronic Dis* 2009;6:A98.
7. Spring B, Sohn MW, Locatelli SM, et al. Individual, facility, and program factors affecting retention in a national weight management program. *BMC Public Health* 2014; 14:363.
8. Frayne SM, Parker VA, Christiansen CL, et al. Health status among 28,000 women veterans. The VA Women's Health Program Evaluation Project. *J Gen Intern Med* 2006; 21 Suppl 3:S40–S46.
9. Mattocks KM, Haskell SG, Krebs EE, et al. Women at war: Understanding how women veterans cope with combat and military sexual trauma. *Soc Sci Med* 2012;74:537–545.
10. Verheijden MW, Bakx JC, van Weel C, et al. Role of social support in lifestyle-focused weight management interventions. *Eur J Clin Nutr* 2005;59 Suppl 1:S179–S186.
11. Jerome GJ, Myers VH, Young DR, et al. Psychosocial predictors of weight loss by race and sex. *Clin Obes* 2015; 5:342–348.
12. Hoerster KD, Lai Z, Goodrich DE, et al. Weight loss after participation in a national VA weight management program among veterans with or without PTSD. *Psychiatr Serv* 2014; 65:1385–1388.
13. Maguen S, Ren L, Bosch JO, et al. Gender differences in mental health diagnoses among Iraq and Afghanistan veterans enrolled in veterans affairs health care. *Am J Public Health* 2010;100:2450–2456.
14. Haskell SG, Gordon KS, Mattocks K, et al. Gender differences in rates of depression, PTSD, pain, obesity, and military sexual trauma among Connecticut War Veterans of Iraq and Afghanistan. *J Womens Health (Larchmt)* 2010;19:267–271.
15. Hirth JM, Rahman M, Berenson AB. The association of posttraumatic stress disorder with fast food and soda consumption and unhealthy weight loss behaviors among young women. *J Womens Health (Larchmt)* 2011;20:1141–1149.
16. Rutledge T, Groesz LM, Savu M. Psychiatric factors and weight loss patterns following gastric bypass surgery in a veteran population. *Obes Surg* 2011;21:29–35.
17. Maciejewski ML, Arterburn DE, Van Scoyoc L, et al. Bariatric surgery and long-term durability of weight loss. *JAMA Surg* 2016;151:1046–1055.
18. Higgins DM, Buta E, Dorflinger L, et al. Psychometric properties of a MOVE!23 subscale: Perceived Contributors to Weight Change in a national sample of veterans. *J Health Psychol* 2016;21:1394–1403.
19. Teixeira PJ, Carraca EV, Marques MM, et al. Successful behavior change in obesity interventions in adults: A systematic review of self-regulation mediators. *BMC Med* 2015;13:84.
20. Klingaman EA, Viverito KM, Medoff DR, et al. Strategies, barriers, and motivation for weight loss among veterans living with schizophrenia. *Psychiatr Rehabil J* 2014;37: 270–276.
21. Johnson MR, Grubber J, Grambow SC, et al. Physician non-adherence to colonoscopy interval guidelines in the Veterans Affairs Healthcare System. *Gastroenterology* 2015; 149:938–951.
22. Kahwati LC, Lance TX, Jones KR, et al. RE-AIM evaluation of the Veterans Health Administration's MOVE! Weight Management Program. *Transl Behav Med* 2011;1: 551–560.
23. Garvin JT, Marion LN, Narsavage GL, et al. Characteristics influencing weight reduction among veterans in the MOVE!(R) program. *West J Nurs Res* 2015;37:50–65.
24. Littman AJ, Boyko EJ, McDonell MB, et al. Evaluation of a weight management program for veterans. *Prev Chronic Dis* 2012;9:E99.
25. Matvienko, DA and Hoehns JD. A lifestyle study in patients with diabetes or impaired glucose tolerance: Translation of a research intervention into practice. *J Amer Board Fam Med* 2009;22:535–543.
26. Moin T, Ertl K. Women veterans' experience with a web-based diabetes prevention program: A qualitative study to inform future practice. *J Med Internet Res* 2015;17:e127.
27. Vimalananda V, Damschroder L, Janney CA, et al. Weight loss among women and men in the ASPIRE-VA behavioral weight loss intervention trial. *Obesity* 2016;24:1884–1891.
28. Garvin JT. Weight reduction goal achievement with high-intensity MOVE!((R)) treatment. *Public Health Nurs* 2015; 32:232–236.

Address correspondence to:

Bryan C. Batch, MD, MHS

Division of Endocrinology, Metabolism, and Nutrition

Department of Medicine

Duke University Medical Center

DUMC Box 3031

Durham, NC 27710

E-mail: bryan.batch@duke.edu