Treating postpartum depression in rural veterans using internet delivered CBT: program evaluation of *MomMoodBooster*

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Abstract Depression in the postpartum period impacts approximately 13–26% of the general population. This number can be much higher for rural veteran women who face additional barriers to accessing specialized mental health services due to isolation and cultural factors. This study reports on a program evaluation of MomMoodBooster, a coach-supported internet-delivered CBT program for the treatment of maternal depression in veteran women. Repeated measures ANOVA, run with this sample of 326 women, demonstrated an overall positive effect size across outcome measures and engagement with no differences found between rural women and their urban counterparts. Some differences between urban and rural participants were found in total and average time spent with coaches as well as ratings of coach helpfulness, possibly indicating some cultural differences between coaches and rural women that need to be addressed. These results and the results of earlier trials suggest that MomMoodBooster can be a valid and efficacious option for reaching under-served veteran populations with specialized postpartum mental health support and is as effective with rural women as with urban women

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Introduction

In the general population, 10–15% of women will develop depression in the perinatal period (Ashford et al., 2016; Thomas et al., 2018). Among active duty and veteran women, the prevalence may be higher. For example, Klaman and Turner (2016) found that 16–32% of veteran women in the antenatal period and 19% in the postpartum period experience depression. Moreover, Appolomio and Fingerhut (2008) reported that 19.5% active duty, exposed to combat, first-time mothers experience postpartum depression. Finally, Schachman and Lindsey (2013) found that 50.7% of mothers (enlisted and civilian sample) with deployed partners experience postpartum depression.

In the general population, risk factors for developing postpartum depression are well known. Military mothers face additional stressors such as the increased isolation of living on base, separation from deployed spouses, comorbid diagnoses of post-traumatic stress disorder (PTSD) (Nguyen et al., 2013), frequent relocations, working longer into pregnancy, less reported support (Klaman & Turner, 2016), and increased incidence of sexual assault and sexual harassment (Kintzle et al., 2015). Although much of the literature addressing women's exposure to trauma and comorbid diagnoses are active military samples, it is reasonable to assume that the impact of these traumatic experiences does not end when military commitment ends and therefore also impacts the experiences of veteran mothers.

The consequences of postpartum depression (PPD) to both mother and child have prompted both the United Kingdom's National Institute for Health and Care Excellence (NICE, 2020) and the U.S. National Research Council and Institute of Medicine (NRCIM, 2009) to recommend prompt intervention for perinatal depression (PND). However, women face many barriers to seeking and/or receiving

treatment and only a small percentage (33–42%) of women experiencing depression in the perinatal period seek assistance (Flynn et al., 2006; Henshaw et al., 2013; Smith et al., 2008). In addition, healthcare providers have trouble recognizing PND and PPD (O'Mahen & Flynn, 2008), which results in low screening and low diagnosis rates (Ashford et al., 2016). The barriers of greatest relevance to this paper are long wait times for face-to-face services, particularly specialized services, the supermom myth and stigma (Lee et al., 2016), and geographical-based barriers (Andrilla et al., 2018).

Rural veteran mothers face additional barriers. The Veterans Health Administration (VHA) Office of Rural Health (ORH) reports that approximately 25% of veterans live in rural communities (Veterans Administration, 2020). When comparing samples of veterans with diagnosed depression, anxiety or PTSD, rural veterans are less likely than their urban counterparts to receive any mental health treatment (Teich et al., 2017), face longer wait times between diagnosis and first appointments, and are less likely to receive specialty mental health care (Cully et al., 2010). In general, rural areas are underserved by mental health professionals (Riding-Malon & Werth, 2014), rural veterans have less access to care, are more affected by distance barriers, and have lower health-related quality of life (Cully et al., 2010; Weeks et al., 2008). Unfortunately, more specific information about the unique experiences of women veterans in the perinatal period are not delineated in the rural veteran mental health literature.

Cultural factors related to military experience and rural values may impact a veteran's willingness to access mental health treatment. For example, research on suicide and help-seeking suggests that agrarian values and stigma contribute to lower help-seeking and initiating mental health services in rural samples (Judd et al., 2006; McCarthy et al., 2012). Other investigators argue that rural values of independence and conformity to social norms contribute to lower levels of acceptance of psychotherapy (Fox et al., 1995; Rost et al., 1993). More work is needed to understand the specific cultural barriers experienced by rural veteran women in the postpartum period.

Given these barriers to diagnosis and treatment, one possibility to increase access is internet delivered therapies (iTx). Internet-based treatments for perinatal depression have been validated as efficacious, resulting in moderate-to-large effect sizes (Andersson & Cuijpers, 2009; Andrews et al., 2010; Ashford et al., 2016; Milgrom et al., 2016; Nair et al., 2018) and are acceptable for the general population (Ashford et al., 2016; Lee et al., 2016). Additionally, women are more likely to report sensitive information over the internet (Le et al., 2009) because this mode of treatment delivery offers anonymity (Lavender et al., 2016) and flexibility to adapt to specific cultural and identity considerations (Lee et al., 2016). The literature in support of internet-based interventions has resulted in the Canadian Network for Mood and Anxiety Treatments (Parikh et al., 2009) and the United Kingdom's Improving Access to Psychological Treatment program (Clark, 2011) recommending web-based interventions as second-line treatments for perinatal depression. iTx may be a viable option for a stepped-care approach (van Ballegooijen et al., 2014) to the treatment of PND and a promising option for reaching rural veteran women who would otherwise not have access to specialized care.

One problem with internet interventions, however, is that adherence can be poor and early dropout rates can be quite significant. van Ballegooijen et al.'s (2014) meta-analysis of adherence to iCBT interventions concluded that 65.1% of those starting supported iCBT completed 100% of the treatment and that adherence and clinical effect were similar between supported iCBT and face-to-face therapies. Additionally, there appears to be a dose–response effect with iTx such that engaging in more sessions correlates with better outcomes. No studies have compared outcomes, attrition, and uptake between urban and rural cohorts. More information is needed in order to understand what aspects of iTx promote initiation, retention and completion for specific populations (Renton et al., 2014).

This report provides an evaluation of programmatic engagement and mental health outcomes for veteran women participating in the *MomMoodBooster* program (Danaher et al., 2013; Milgrom et al., 2016), an empirically validated iTx for postpartum depression. More specifically, this paper reports on a program evaluation comparing urban veteran women to their rural counterparts using pre-post measures of depression, behavioral activation, and automatic thoughts. The goal was to determine if *MomMoodBooster* for veteran women, a six session, coach-supported, CBT-based, iTx delivered to veteran women across the United States is a promising option for treatment of PPD in the rural veteran population.

Methods

Participants

Veteran women with a confirmed live birth in their VA medical record between March 2015 and August 2019 were mailed recruitment letters and then contacted by phone to screen for interest and eligibility. To be eligible for inclusion women had to be between the ages of 18 and 50 and be within 18 months of the birth of their baby with access to phone and internet. Screening consisted of the Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001) using the recommended cut-point of 10 for inclusion (Gilbody et al., 2007). The PHQ-9 has been validated for screening in the

perinatal (Sidebottom et al., 2012) and military (Searle et al., 2019) populations. Women scoring 10 or greater on the nine-item PHQ-9 were then screened for major depression, mania, hypomania, and psychosis using the respective subscales from the Mini International Neuropsychiatric Interview (M.I.N.I. 5.0.0; Sheehan et al., 1998). Women with a history of past but not current hypomanic episodes were included. Women could be in concurrent psychotherapy or be using psychotropic medications.

Exclusion criteria

Women reporting current suicidality as indicated by a 2 ("More than half the days") or 3 ("Nearly every day") on item 9 of the PHQ-9, "Thoughts that you would be better off dead, or of hurting yourself in some way," (Kroenke et al., 2001) were excluded after risk assessment and safety planning. Individuals with a history of current or previous manic episodes, current hypomanic episodes, or a presence

of psychotic symptoms were excluded and encouraged to reach out to mental health providers at their local VA. Currently pregnant women were excluded.

Procedure

Following recruitment letters, women were contacted by phone to discuss interest and enrollment procedures. Those eligible after screening were mailed a consent and baseline packet. Participants with returned baseline questionnaires were added to a waitlist for the first available coach. See Fig. 1 for participant flow through the program. Coaches contacted participants for a welcome call and then six scheduled coaching calls. Participants were reminded of their scheduled times with coaches via text reminders, which most participants consented to receive. Participants completed questionnaires at baseline and 3 months post-baseline. For each time point participants received $25 for returned questionnaires. Ethics approval was obtained from the University

Fig. 1 Flowchart of participants. *Note* u = urban, r = rural
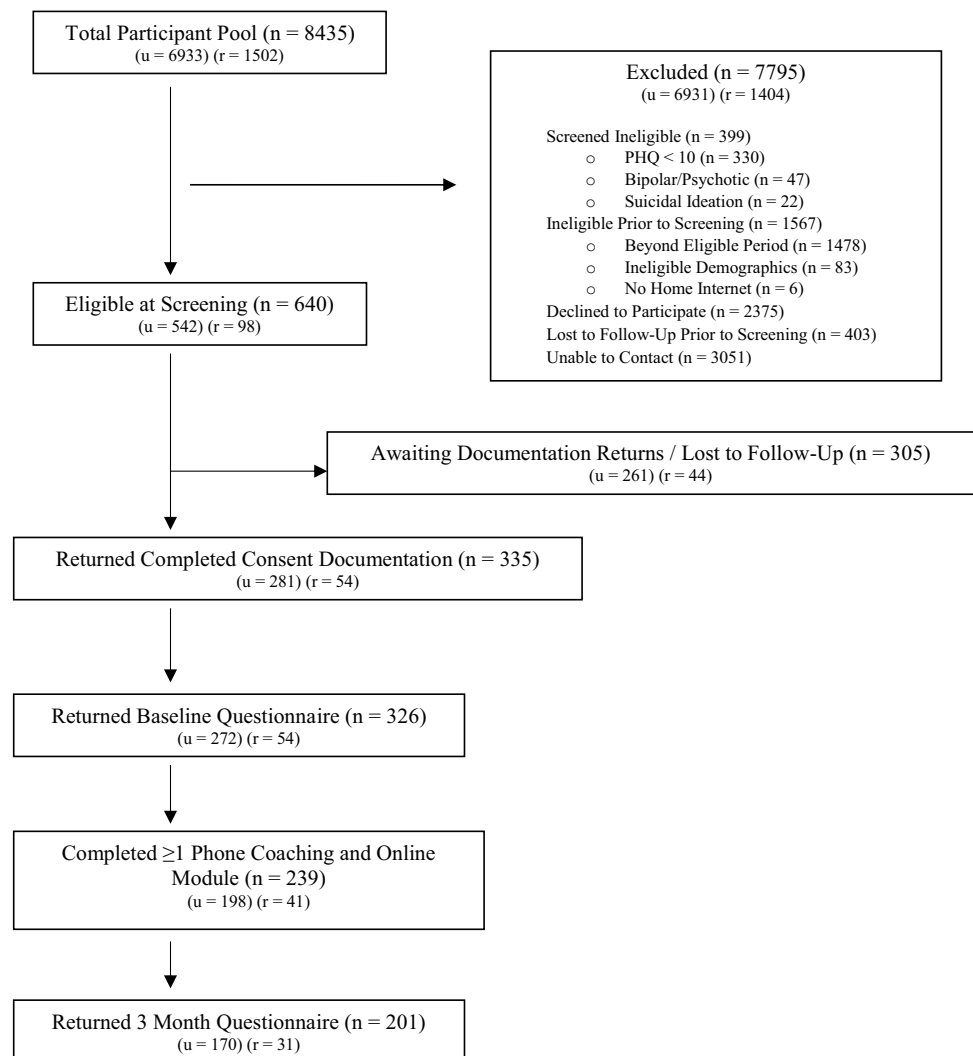
of Iowa Institutional Review Board, and all participants provided informed consent.

Measures

Participant demographics

Baseline questions included age, date of delivery, baby gender, parity, marital status, ethnicity, education, family income, occupation, amount of previous counseling, and length of time on anti-depressant medication.

Primary outcomes

Behavioral activation for depression

The Behavioral Activation for Depression Scale (BADS; Kanter et al., 2007) is a 25-item self-report measure that consists of a total score, as well as four subscales: Activation, Avoidance/Rumination, Work/School Impairment, and Social Impairment. Behavioral activation is considered an essential component of treatment of depression (Fuhr et al., 2016). Standalone behavioral activation is a validated treatment for depression with two meta-analyses demonstrating large and significant effect sizes (Cuijpers et al., 2007; Mazzucchelli et al., 2009). The reliability of the BADS-Total for this sample at baseline and follow-up were $\alpha = 0.850$ and $\alpha = 0.918$, respectively.

Inventory of depression and anxiety symptoms II

The Inventory of Depression and Anxiety Symptoms II (IDAS-II; Watson et al., 2008, 2012) is a multi-scale measure of the core symptoms of depression and anxiety. The General Depression scale, a 20-item scale meant to capture the full range of diagnostic criteria for depression, has been validated for use with postpartum women (Watson et al., 2007). In this sample, the reliability of IDAS General Depression was $\alpha = 0.860$ and $\alpha = 0.923$ at baseline and follow-up, respectively.

Automatic Thoughts Questionnaire

The Automatic Thoughts Questionnaire (ATQ; Hollon & Kendall, 1980) is a 15-item self-report measure developed to capture the severity of automatic thoughts in depressed individuals (Netemeyer et al., 2002). The 15-item short version of the ATQ has been validated as a predictor of negative affect, such as self-esteem and maladjusted thinking patterns (Netemeyer et al., 2002). The reliability of the ATQ for this sample was $\alpha = 0.920$ at baseline and $\alpha = 0.945$ at follow-up.

Program and coach ratings

A four-point scale on the follow-up questionnaire asked participants to rate the program and the coach using the following anchors: (1) not at all helpful, (2) somewhat helpful, (3) moderately helpful, and (4) very helpful. Open-ended responses included helpfulness of program and coach, and improvements that could be made to the program and coaching.

Intervention

MomMoodBooster is a secure, web-based, six-module, coach-supported, interactive intervention tailored for women experiencing postpartum depression (Danaher et al., 2012, 2013). Six sequential modules guide women through Cognitive Behavioral Therapy (CBT) content tailored to address the unique experiences of the postpartum period. Session titles include: (1) Getting Started, (2) Tracking Mood, (3) Pleasant Activities, (4) Managing Your Negative Thoughts, (5) Increasing Your Positive Thoughts, and (6) Planning for the Future. Participants engage in self-paced sessions with each successive module opening on a weekly basis.

Personal coaches support participants as they moved through sessions. With one exception, coaches were advanced graduate students in clinical and counseling psychology programs who received supervision on a regular basis. The remaining coach was a post-doctoral Ph.D. with 2 years' experience working with the *MomMoodBooster* program. Length of experience working with *MomMoodBooster* participants ranged from several months to 4 years. The number of participants per coach ranged from 3 to 144 (median = 22).

The coach is designed to be a non-therapeutic point of personal contact, supporting the participants, encouraging program engagement, and clarifying content and use of the program. Coaching was approached first using an accountability model and then later using an alliance-based model where coaches engaged in an unstructured conversation focused on creating a positive supportive relationship with the participant. Coaching calls occurred weekly and lasted approximately 10–15 min in length. At sessions three and five, coaches assessed current mood using the PHQ-9 (Kroenke et al., 2001). In this context, the PHQ-9 was used for safety purposes to detect suicidal ideation and significant deterioration. It was not obtained at follow-up and was not an outcome measure.

Statistical analysis

SPSS, version 25, was used for all analyses and tests of significance between urban and rural participants. All tests of significance were two-tailed, with significance set to 0.05.

Item-level missing data were imputed using mean imputation for scales with fewer than 20% of items missing. For the IDAS-GD, ATQ, and BADS, maximum imputations for missing items were four, three, and four items on these measures, respectively.

Analyses were conducted using both intention-to-treat (ITT) and completer data. For ITT analyses, penalized imputation was used in the absence of follow-up data, following the conservative assumption that depressive symptoms remained the same. Results are reported for both ITT and completers analyses.

Primary outcomes included depressive symptoms, behavioral activation, and automatic thoughts. Given observed strong correlations among the subscales of the BADS measure, the total score was used in primary outcome analyses. Repeated-measures ANOVA examined changes over time (baseline, follow-up) and compared rural/urban residing groups. The results were interpreted with sphericity assumed given that for each measure, there were only two factors. Box's test of equality of covariance matrices and Levene's test of equality of error variances were examined to ensure assumptions were not violated. Effect sizes were estimated using partial eta squared with the following considerations of magnitude: small = 0.01, moderate = 0.06, and large = 0.14 (Cohen, 1988).

Results

Baseline characteristics

Descriptive statistics were calculated to characterize the sample (n = 326, see Table 1). Participants ranged in age from 21 to 45 years. There were significant differences between rural and urban veteran women with respect to race/ethnicity. Rural veteran women were largely White (77%); over 25% of urban veteran women were Black, compared to about 4% of rural veteran women. At time of entry into the program, urban veteran women had significantly higher PHQ-9 scores (see Table 1).

Treatment adherence and utilization

Participants who accepted a welcome call logged on to the *MomMoodBooster* website an average of 7.61 times (SD = 7.54) over an average engagement of approximately 2 months. Women completed about 61% of the six available modules. Overall, participants completed an average of 3.35 coaching sessions with no difference between urban and rural participants (see Table 2). However, urban women did spend significantly more time on each call with their coaches, $t = 2.359$, $p = 0.019$ (see Table 2).

Adherence was defined in terms of several metrics, including modules opened, mean completion percentage, and percentage who completed 80% and 100% of the six modules (van Ballegooijen et al., 2014) (see Table 2). Mean completion of lessons was 60.63%. Overall, 50.0% of veteran women were exposed to at least 80% of modules and 44.5% of veteran women were exposed at the 100% level of modules. There were no differences between urban and rural users for any of these metrics. These completion rates are not adjusted to account for those participants who dropped out after recovery as indicated by a PHQ-9 score below the clinical cut-off of 10 (a total of 21 women) following completion of modules three or five.

Program and coach ratings

Participants provided favorable ratings for the program and the coach. The average program rating was 3.21 (SD = 0.876) on the 4-point scale with no difference between urban and rural users. With respect to coach ratings, however, there was a significant difference between rural and urban users, with coaches rated more favorably by urban users; average urban rating of coach was 3.28 (SD = 0.932) and for rural users it was 2.79 (SD = 1.197), $p = 0.047$ (see Table 2).

Intention-to-treat analyses

Depressive symptoms

Reductions in depressive symptoms were observed over time, $F(1,315) = 61.69$, $p < 0.001$, $\eta_p^2 = 0.16$. There was no main effect of rural/urban residence, $F(1,315) = 0.18$, $p = 0.67$, $\eta_p^2 = 0.00$. There was no interaction between time and rural/urban residence, $F(1, 315) = 0.24$, $p = 0.63$, $\eta_p^2 = 0.00$ (see Table 3 for all primary outcome means and SD).

Behavioral activation

Increased behavioral activation was reported over time, $F(1, 313) = 55.05$, $p < 0.001$, $\eta_p^2 = 0.15$. The main effect of rural/urban residence was not significant, $F(1, 313) = 0.46$, $p = 0.5$, $\eta_p^2 = 0.0$. There was no significant interaction between time and rural/urban residence, $F(1, 313) = 0.49$, $p = 0.49$, $\eta_p^2 = 0.0$.

Automatic thoughts

Automatic thoughts reduced over time, $F(1, 318) = 29.21$, $p < 0.001$, $\eta_p^2 = 0.08$. The main effect of rural/urban residence was not significant, $F(1, 318) = 0.0$, $p = 0.97$, $\eta_p^2 = 0.0$. The interaction between time and rural/urban residence was not significant, $F(1, 318) = 0.48$, $p = 0.49$, $\eta_p^2 = 0.0$.

Table 1 Participant demographics and baseline characteristics

	Overall (n = 326)	Urban (n = 272)	Rural (n = 54)	X²/t-value
Age at screening [mean (SD)]	32.31 (4.55)	32.30 (4.53)	32.4 (4.73)	− .145
Days: birth to baseline [mean (SD)]	237.09 (117.9)	239.39 (120.70)	225.42 (104.12)	− .787
No. of children				
1 Child	38.9%	40.4%	31.5%	1.403
2 Children	35.2%	34.8%	37.0%	
≥ 3 Children	25.9%	24.8%	31.5%	
Partnered	68.2%	67.4%	72.2%	.582
Race/ethnicity				
White	48.8%	43.7%	77.4%*	19.098**
Black	21.7%	25.2%	3.8%	
Latino/a	15.8%	16.7%	11.3%	
A/PI, AI/AN	2.4%	2.7%	1.9%	
Other	10.7%	11.8%	5.7%	
Education				
High school/GED	17.6%	16.6%	22.2%	.200
Bachelors/associates	56.1%	55.2%	61.1%	
Master's/doctoral	16.7%	18.2%	9.3%	
Other	9.6%	10.0%	7.4%	
Family income				
< $40,000	30.2%	28.5%	39.9%	2.707
$40–60,000	22.7%	23.6%	18.5%	
$60–80,000	17.4%	18.7%	11.1%	
≥ 80,000	20.6%	20.2%	22.2%	
Prefer not to say	8.7%	8.6%	9.3%	
Occupation				
Student	12.9%	13.5%	9.8%	2.732
Work outside home	64.4%	65.5%	58.8%	
At-home parent	22.8%	21.0%	31.4%	
Rurality				
Urban	83.7%			
Large rural	9.2%			
Small rural	3.1%			
Isolated	4.0%			
Previous or current therapy	89.8%	90.7%	85.2%	1.494
Current psychotropic medication	74.8%	73.4%	81.5%	1.662
Major depression at screening	68.2%	70.1%	59.3%	2.420
PHQ-9 at screening [mean (SD)]	15.28 (3.51)	15.45 (3.54)	14.38 (3.24)	2.048*

Chi² tests were used to compare rural versus urban

*Denotes $p < .05$ and **denotes $p < .01$ using 1 child versus > 1 child, partnered versus not partnered, white versus non-white, associate's degree and beyond versus high school/GED, income < $40,000 versus $40,000 or greater, student versus work outside the home versus stay at home parent, prior counseling yes/no, medication yes/no, major depression at screening yes/no. Independent samples t-tests were used to compare rural versus urban for age at screening, days birth to baseline, and PHQ-9 at screening; A/PI, AI/NA = Asian, Pacific Islander, American Indian, Native American

Completers analyses

Depressive symptoms

Depressive symptoms declined over time, $F(1,188) = 82.78$, $p < 0.001$, $\eta_p^2 = 0.31$. The main effect of rural/urban residence was not significant, $F(1,188) = 0.40$, $p = 0.53$, $\eta_p^2 = 0.0$. The interaction between time and rural/urban residence was not significant, $F(1,188) = 0.13$, $p = 0.72$, $\eta_p^2 = 0.0$.

Table 2 Program use and engagement

	Overall	Urban	Rural	X^2/t-value
Days in program				
Baseline to follow-up (days)	121.44 (33.0)	122.18 (35.3)	117.52 (16.12)	.720
Welcome call to last log-in (days)	60.67 (43.78)	60.54 (37.58)	61.22 (65.49)	− .099
Engagement				
Welcome to last coaching (days)	61.33 (36.76)	61.63 (36.00)	59.64 (41.26)	.299
Coaching sessions completed	3.35 (2.55)	3.46 (2.56)	2.83 (2.49)	1.646
Total minutes with coach	47.19 (50.18)	50.14 (51.94)	33.16 (38.14)	2.748**
Average minutes per call	10.13 (7.93)	10.62 (8.13)	7.81 (6.49)	2.359*
Modules opened	3.85 (2.39)	3.86 (2.39)	3.81 (2.44)	.131
Mean completion (%)	60.63 (40.05)	60.29 (41.55)	62.35 (41.23)	− .332
80% completion: modules	50.0%	49.6%	51.9%	1.051
100% completion: modules	44.5%	43.8%	48.1%	2.287
N–C mean completion (%)	23.1 (24.17)	23.11 (24.61)	23.08 (22.15)	.007
Program rating				
Program helpful	3.21 (.876)	3.25 (.844)	2.97 (1.017)	1.632
Coach helpful	3.20 (.991)	3.28 (.932)	2.79 (1.197)	2.063*
Follow-up questionnaire completed	60.4%	60.7%	59.3%	.037

Numbers are reported as mean (SD) unless otherwise indicated. There were a total six coaching sessions available. Mean completion is reported as the overall percentage of six available modules completed. Completion at 80% and 100% indicates the percentage of the sample completing available modules to these respective levels with six modules available. N–C mean completion refers to the average completion of non-completers, those who did not reach the 80% level. Independent samples t-tests and chi^2 tests were used to compare rural versus urban

*Denotes $p < .05$. **denotes $p < .01$, two-tailed

Behavioral activation

Behavioral activation increased over time, $F(1,188) = 71.81$, $p < 0.001$, $\eta_p^2 = 0.28$. The main effect of rural/urban residence was not significant, $F(1,188) = 0.09$, $p = 0.77$, $\eta_p^2 = 0.0$. There was no significant interaction between time and rural/urban residence, $F(1,188) = 0.25$, $p = 0.62$, $\eta_p^2 = 0.0$.

Automatic thoughts

Decreases in automatic thoughts were observed over time, $F(1, 190) = 33.36$, $p < 0.001$, $\eta_p^2 = 0.15$. The main effect of rural/urban residence was not significant, $F(1,190) = 0.02$, $p = 0.90$, $\eta_p^2 = 0.0$. There was no significant interaction between time and rural/urban residence with automatic thoughts, $F(1,190) = 0.37$, $p = 0.55$, $\eta_p^2 = 0.0$.

Discussion

Response to the *MomMoodBooster* intervention

The *MomMoodBooster* program has been evaluated in two trials, one uncontrolled (Danaher et al., 2013) and one controlled trial (Milgrom et al., 2016). Positive results were obtained in both trials. The current report describes outcomes from implementation of the *MomMoodBooster* program with women veterans. Because the goal was dissemination of the program nationwide, a controlled trial was not feasible. The present analyses examined whether outcomes differed across rural and urban residing veteran women, given known health disparities experienced by rural-residing individuals.

Participation in the *MomMoodBooster* program was associated with decreased depressive symptoms, increased

Table 3 Primary outcomes for completers and intention to treat

	n	Overall	n	Urban	n	Rural
Baseline						
IDAS GD	325	66.26 (11.73)	271	66.40 (11.78)	54	65.56 (11.53)
BADS total	322	66.25 (21.78)	268	65.65 (21.89)	54	69.24 (21.19)
ATQ	325	35.07 (9.94)	271	35.09 (9.94)	54	34.98 (10.03)
Completers follow-up						
IDAS GD	190	52.88 (14.85)	160	53.03 (14.67)	30	52.07 (15.97)
BADS total	191	89.21 (26.34)	162	89.57 (26.01)	29	87.21 (28.49)
ATQ	193	28.61 (10.12)	163	28.48 (9.94)	30	29.30 (11.22)
Intention to treat follow-up						
IDAS GD	317	58.63 (15.36)	265	58.68 (15.19)	51	58.35 (16.37)
BADS total	316	79.27 (27.46)	265	79.07 (27.66)	52	80.27 (26.62)
ATQ	321	31.59 (10.61)	269	31.53 (10.59)	52	31.90 (10.83)

All results are noted as mean (SD)

IDAS GD inventory for depression and anxiety symptoms general depression scale, *BADS total* behavioral activation for depression scale total score, *ATQ* Automatic Thoughts Questionnaire

behavioral activation, and decreased dysfunctional automatic thoughts. Effect sizes across all these outcomes were large (Cohen, 1988) among completers. Effect sizes were large for depressive symptoms and behavioral activation in the ITT analyses. Veteran women entering the program had significant depressive symptoms.

About 75% of the veteran women were taking antidepressant medication, and almost 90% of women had previous or current experience with psychotherapy. Average level of the PHQ-9 at program entry was over 15, which is considered "moderately severe" (Kroenke et al., 2001). More than two-thirds of women were experiencing a current major depression. In sum, the veteran women who participated in the *MomMoodBooster* program were experiencing significant suffering and depression morbidity that was not being sufficiently addressed by available mental health care.

The *MomMoodBooster* program was designed to treat postpartum depressive symptoms through a cognitive-behavioral approach. The treatment seeks to target the therapeutic processes measured in this study—behavioral activation and automatic thoughts. The changes observed across these processes are encouraging and suggests that treatment was associated with change in these areas. Of course, without a control condition it is not possible to directly attribute change to the *MomMoodBooster* program itself. Nevertheless, while depressive symptoms are known to change with passage of time, the BADS, for example, has demonstrated strong test–retest reliability, and such scores would not be expected to change spontaneously (Kanter et al., 2007). Moreover, postpartum depressed women in the treatment as usual condition in the Milgrom et al. (2016) trial only had about a 0.4 SD change from baseline to follow-up for both the BADS and the ATQ, providing some indication

that the passage of time may not explain the results in the current study.

Uptake and use of *MomMoodBooster* among rural and urban veteran women

One of the goals of the *MomMoodBooster* program was to disseminate services to rural residing women who because of access limitations or cultural issues might not readily seek mental health treatment. Regarding access to services, the general erosion of health care services in rural areas has contributed to a longstanding shortage of mental health care providers in those regions. The National Institute of Mental Health (NIMH, 2018) indicated that 60% of rural Americans live in mental health professional shortage areas. With respect to veterans specifically, Teich et al. (2017) indicated that rural veterans with a mental health diagnosis are less likely than their urban counterparts to receive any mental health treatment. Also, rural veterans are less likely to receive specialty mental health care (Cully et al., 2010).

As noted earlier, approximately 25% of veterans live in rural America. The *MomMoodBooster* program reached out to all eligible veteran postpartum women, regardless of rural/urban residence, and surprisingly, only 17.8% of the 8,435 eligible veteran women resided in rural areas. One potential explanation for this seemingly under-representation of rural veteran women in our overall pool is that the VA database only contained the records of veteran women whose maternity care was paid for by VA. Although VA maternity care coordinators provide prenatal care to pregnant veteran women, VA does not provide obstetrical services. Veteran women invariably receive obstetrical care from non-VA providers who are paid by VA. Many veteran women

have private insurance or choose not to afford themselves of VA-supported private care. As a result, women who do not utilize VA-supported private care are not included in the database that served as the basis for recruitment. This raises the possibility that rural veteran women are using VA paid maternity care at a much lower rate than their urban counterparts or the possibility that veteran women of childbearing age are more likely to live in urban areas than veterans as a whole. Furthermore, the data regarding veteran rural/urban residence is reported across genders, so it cannot be determined whether the representation of rural women in this study aligns with veteran women nationwide [U.S. Department of Veterans Affairs (VA), 2020]. Participation in the *MomMoodBooster* program largely tracked the overall representation of veteran women in the pool, suggesting that rural veteran women were not less likely to stay the course through the *MomMoodBooster* program.

There were no differences in response to the *MomMoodBooster* program between rural and urban dwelling veteran women. In the current context, it is reassuring that rural dwelling veteran women are as likely to participate in and benefit from an online, coach supported program for postpartum depression as urban dwelling women. Cultural issues regarding acceptability of psychotherapy, whether provided face-to-face or in the context of an internet-based intervention, appear not to have significantly impacted the outcomes across rural and urban residing veterans. However, there was one area in which rural and urban dwelling women did differ significantly: time in contact with the phone coach. For both average minutes per call and the total number of minutes across all calls with a coach, rural-dwelling veteran women spent significantly less time. This difference may be at least partially explained by the rural agrarian value system which has been associated with distrust of science and technology (Heath, 2020) and the distinct cultural aspects of rural identity that include a skepticism of outsiders (Slama, 2004). Time spent with coaches may have also been related to the rural values of self-reliance and stoicism. For example, Robinson et al. (2012) argued that these interpersonal approaches to life mean that consulting a mental health professional carries a great deal of stigma, which is a barrier to receiving services. In one study addressing rural low-income women, the prevalence rate of major and minor depression was 38%, and yet only 2.3% of those with a diagnosis were receiving counseling (Price & Proctor, 2009). It may be that rural women are less comfortable with discussing psychological symptom management in general or feel reluctant to discuss personal matters with an unfamiliar provider. Rural women may therefore have derived more benefit from the anonymity of the online content than the phone coaching.

Other literature indicates that rural residents are more likely to rely on informal support systems like family and primary care physicians rather than mental health care professionals (Robinson et al., 2012). Rural women in our sample may not have engaged as much with coaching because of these relatively more well-developed social support systems. Social support has been inversely associated with depressive symptoms. Ross et al. (2011) found that rural women have higher levels of social network diversity which was significantly related to lower postpartum EPDS scores. With respect to reliance on primary care physicians for mental health care, it is important to note that integration of mental health services into rural primary care settings has been suggested for addressing disparities in access to care. Women have expressed that they prefer to have depression treatment considered part of prenatal care (Bhat et al., 2018). However, with less than one-fifth of rural communities having local obstetrics care (Nidey et al., 2020), additional options such as remote care provisions like *MomMoodBooster* may be vital to closing the rural–urban gap. Having demonstrated similar effectiveness for rural women makes this a promising option.

Program participants opened an average of about four of the six program modules and overall completed about 61% of the program lessons. Fifty percent of program participants completed at least 80% of modules. There were no differences across groups. These rates are somewhat lower than two previous *MomMoodBooster* trials (Danaher et al., 2013; Milgrom et al., 2016), but only a total of 74 postpartum depressed women had been included in these two trials. The number of postpartum depressed women in the *MomMoodBooster* program was nearly five times that of the two previous two trials together. Moreover, rather than representing just a few communities where the other studies were conducted, women in the VA *MomMoodBooster* program were very diverse in race, ethnicity, rurality, and geographic locale, and represented 46 of the 50 states and the District of Columbia. Participants had very favorable overall ratings of the program (3.21 on a 4-point scale) and the coaches (3.20 on a 4-point scale), though urban veterans rated coaches more highly than did rural veterans. It will be important for phone coaches and staff to recognize the diversity in postpartum depressed veteran women, reflect on cultural opportunities (Hayes et al., 2015), and adjust coaching accordingly to maximize participants' engagement in the program.

Limitations

Program staff were able to reach out by letter to 8,435 postpartum veteran women over the course of several years (see Figure #1). However, program staff were unable to make phone contact with 3051 of these women. Many of these women may have been reluctant to answer a call from an unfamiliar number even though they were alerted by the

program introductory letter that a call would be forthcoming. Additionally, 2375 women declined to participate. These women were most likely to be feeling well and had no need for the *MomMoodBooster* program. Another 1966 women were ineligible for different reasons. Other women were eligible at screening but were lost along the way. More work is needed to understand the unique barriers to initiation, engagement, and completion for both urban and rural dwelling veteran women.

Strengths

One important positive feature of the *MomMoodBooster* program had little to do with its impact on the mental health of veteran women who utilized the program. Staff reached out by letter to a very large number of postpartum veteran women over a 5-year period, signaling to women whether they were well or experiencing mood symptoms in the postpartum period that the VA recognized their vulnerability and was offering a free mental health program that was accessible to them no matter where they lived. Relatedly, program staff were trained to assess postpartum depression and related conditions, addressing previously reported shortfalls in screening and detection of perinatal mood disorders (Ashford et al., 2016). The *MomMoodBooster* program for veteran women recruiting strategy provides a layer of screening otherwise unavailable to postpartum veterans, thereby increasing the chances that women in need of services will have access to much needed support. The national reach of the recruiting strategy opens new possibilities for reaching women in rural locations who might otherwise struggle to connect with specialized services. *MomMoodBooster* is a efficacious (Danaher et al., 2013; Milgrom et al., 2016) and accessible option that for some may be the sole option for managing postpartum symptoms and for others may be one level of a stepped-care model of treatment for PPD (O'Mahen et al., 2013). The format of the online content is highly structured and interactive, which, when combined with supportive coaching, increases acceptance and reduces attrition (van Ballegooijen et al., 2014).

Initiation of the program was slightly higher than what has previously been reported in the literature as the help-seeking average (33–42%) among those with a diagnosis of depression. Of those screened eligible, 48.1% received a welcome call from a coach, 44.86% engaged with the first session and 36.72% engaged with the first coaching call. This suggests that the personal contact with eligible women makes a difference in comfort and willingness to engage in services. These results are consistent with previous literature that demonstrates that tailoring interventions to the specific concerns of the perinatal period increases engagement (O'Mahen et al., 2012). Finally, the size of this sample gives us relative certainty of the reported effects.

Conclusion

The *MomMoodBooster* program showed clear value for treatment of PPD in rural and urban settings. Continuing to work toward improving initiation and retention of women as well as dissemination of the program through partnerships with community providers may further improve access for under-served veteran women.

More work is needed to understand the specific aspects of the program and coaching that contribute to positive outcomes for women, as well as to further understand the unique experiences and barriers of both rural life and women experiencing postpartum depression. Additional options for treatment and prevention during the antenatal period may help to further reduce the mental health burden of perinatal depression. Finally, the move to telemedicine associated with COVID-19 makes the availability of programs like *MomMoodBooster* even more important as a viable alternative to face-to-face care.

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