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## Mental Health Applications as a Resource for Reducing Access Disparities? A Case Example from a Disaster Mental Health App

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**MENTAL HEALTH APPLICATIONS AS A RESOURCE FOR REDUCING ACCESS  
DISPARITIES?  
A CASE EXAMPLE FROM A DISASTER MENTAL HEALTH APP**

An Undergraduate Honors Thesis

Submitted in Partial fulfillment of

University Honors Program Requirements

University of Nebraska-Lincoln

by

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## ABSTRACT

Past research indicates Latinx individuals underutilize mental health services when it comes to addressing their mental health concerns, but often fail to mention the barriers to underutilization. Systemic barriers to seeking care largely fall under two larger umbrellas: cost and availability. A focus on whether disparities observed in traditional mental health services persisted for a trauma-focused app that recruited participants from the 2017 Hurricane outbreak provides us a unique outlook on a comparative analysis of utilization and engagement between the applications, *Bounce Back Now* (BBN) and *Enhanced Usual Care*. BBN is made up of four major components including tracking, coping and quick tips, self-help components (Activate, Write, Sleep), and the Get Help feature that provides immediate professional support. A sample of 1,357 help-seeking participants allowed for the automatic tracking of each participant's use of each app component. Comparisons of Latinx participant rates for utilization and benefits from the app compared with non-Latinx participants indicated Latinx participants were less likely to have received talk therapy within the past month (*w/o control covariates*) and more likely to have received medication within the last month. Overall, Latinx participants had higher engagement rates across all app components excluding MyPlan and access of Activate. Additionally, Latinx participants reported higher baseline symptoms across sleep difficulties, PTSD, and depression suggesting lower access to care and a higher rate of delayed care. These findings highlight the importance of providing better availability and dissemination of apps for Latinx populations (e.g., more bilingual apps).

**Key Words:** mental health, Bounce Back Now, systemic barriers, engagement, utilization

## DEDICATION

With the utmost gratitude, I humbly dedicate this piece of work to my faculty mentor, *Dr. Trey “Arthur” Andrews III*, for his guidance and support this past year, and above all for always believing in me. My thesis would not have been possible without you and for that, I will always be grateful for.

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Above all, to my parents for providing me the opportunity to seek higher education and pursue dreams they’ve always dreamt of. *Gracias por su apoyo, amor, y ‘hechale ganas hija.’*

*Laura Perez-Villagomez*

## **Mental Health Applications as a Resource for Reducing Access Disparities? A Case Example from a Disaster Mental Health App**

Approximately half of those with an identified mental health need do not receive care (Golub et al., 2013). The lack of access to mental health care is often characterized by extreme racial/ethnic inequalities with Latinx populations receiving care at a 40% lower rate than non-Latinx Whites (Benuto et al., 2019). The racial/ethnic gap in care access is greater for mental health than for other healthcare services (Cook et al., 2017). Even when Latinx populations seek care, relative to non-Latinx Whites, they receive a shorter duration of care and experience overall lower satisfaction (Derose et al., 2009). Furthermore, disparities in care access result in Latinx populations receiving care later and thus often at a more severe stage of mental illness, compared with non-Latinx Whites (Cook et al, 2013). Mobile mental health applications (“apps”) have frequently been proposed as one solution to address this care access gap. However, few empirically tested apps exist in Spanish and few studies have examined whether apps represent an acceptable and accessible method of help-seeking for Latinx populations.

### **Introduction to Structural and Systemic Barriers to Mental Health Care**

Mental health disparities negatively impact ethnic and racial minorities living in the United States (Escobar-Galvez et al., 2023). Unequal access to mental health care services among Latinx populations has been a longstanding concern (e.g., surgeon general report from 2000). Latinos face disparities that are often marked by less access to care and poorer quality of mental health care service utilization (Escobar-Galvez et al., 2023). Barriers to care, go beyond cultural preferences but rather entail systemic barriers such as insurance, cost, time, travel, and availability. Systemic barriers largely fall under two larger umbrellas: cost and availability (Parker et al., 2018).

#### ***Cost and Insurance***

In terms of cost-related barriers, health insurance, or a lack thereof has received considerable attention. National data shows that 34% of Latinx do not have health insurance and 27% do not have access to a usual source of health care (Perez-Escamilla, 2009). Bridges and colleagues (2012) conducted a study with 84 participants that examined mental health needs and service utilization by Hispanic immigrants. They found economic barriers to be the most frequent barrier when seeking health and mental health services. “Response to an open-ended question revealed that 58.8% of participants reported that services were too costly and 35.0% were impeded from service seeking because of lack of health insurance” (Bridges, Andrews, & Deen, 2012). In a separate study, an estimated 40% of Latinos identified the cost of treatment as a prominent barrier to not accessing mental health support (Parra-Cardona & DeAndrea, 2016, p. 288). More specifically, 5% cited a lack of health coverage, and 10% of insufficient level of coverage as hindering factors (Parra-Cardona & DeAndrea, 2016, p. 288). Mental health applications such as mental health technology tools are available with little to no cost and these costs are usually one-time (e.g., they aren’t subscription models or pay-per-session models) which would be one solution to addressing cost and insurance barriers.

### ***Sociocultural Barriers to Care***

Furthermore, with approximately 40% of the Latinx population in the United States being foreign-born, it is critical to account for variables related to immigration such as acculturation-related and socioeconomic challenges. A systematic review of 77 studies found that Hispanic Immigrants living in the United States are at a very high risk of not having access to health care compared with non-immigrant Hispanics and non-Hispanic Whites; noncitizenship status is a major barrier to health care program eligibility. Additionally, fear of stigma and deportation are

identifiable risk factors for lack of access to healthcare among Hispanic Immigrants (Perez-Escamilla, Garcia, & Song, 2010).

***Hidden Costs: Travel, Time off Work, Childcare, etc.***

The direct costs of services are not the only financial barriers that disproportionately impact Latinxs when trying to access care (Martinez & Carter-Pokras, 2006). Tulumiero and colleagues found that distance was a significant barrier to care due to limited transportation options between public and personal transportation. ‘It is difficult because there are times when there isn’t [enough space] in a small bus or I don’t have a ride.’ (Tulumiero et al., 2021). Mental health apps reduce travel costs due to their easy accessibility to nearly anywhere with service and internet access. Other logistical barriers include inconveniently located health services, hours of operation, and the inability of many participants to leave their place of employment to attend to their own or their children’s medical needs. (i.e., ‘Sometimes there is no time, or you have to work’, ‘there need to be services after 5 or 6 pm’, ‘And on Saturdays and Sundays’) (Martinez & Carter-Pokras, 2006).

***Availability of Culturally and Linguistically Appropriate Services***

Barrio and colleagues (2007) conducted a qualitative study of 14 Latinos to understand the problems and solutions related to the need for or use of mental health services. Three stakeholder groups were created within their analysis: four *healthcare and social services providers*, five *consumers*, and five *caregivers*. Their results highlighted three primary organizational barriers to accessing services all of which embodied language and cultural barriers. The unmet need for age- and culturally appropriate services was found in all stakeholder groups (Barrio et al., 2008). Lack of culturally and linguistically appropriate services entails a shortage of bilingual or linguistically trained mental health professionals to whom Latino

individuals can effectively and comfortably communicate their mental health concerns (Peters et al., 2014). Lack of availability impedes members of the Latinx Community to seek mental health services and therefore, contributes to the ethnic and racial disparities that coexist in mental health care (Barksdale et al., 2014). Latinx individuals who prefer to communicate in Spanish often face the barrier to communicating effectively with mental health professionals due to their lack of linguistic and cultural proficiency, including not feeling comfortable or having concerns about poor translation with interpreters if present (Peters et al., 2014).

### **Apps as a Non-Existent Solution: Review of Marketplace Analysis**

Given all the noted barriers to care, apps have regularly been proposed as a needed solution. Apps are beneficial since they easily allow clients to check on themselves when healthcare providers are not available. In a review of the commercial market, only 32 out of 220 (14.5%) applications offered Spanish operability and none of these had empirical evidence demonstrating efficacy (Muñoz, Camacho, & Torous, 2021). Despite an increase in interest in Spanish-language apps to help address mental health, the commercial marketplace is not meeting the needs of the Latinx community (Muñoz, Camacho, & Torous, 2021). Findings have shown that internet-based self-help applications hold a structure that is nearly identical to very effective in-person depression treatments (Ralston, Andrews, & Hope, 2019) yet, are not meant to replace mental health services that already exist but rather provide aid as a self-management tool (Neary & Schueller, 2018). An analysis of varying technology tools that exist to help address mental health concerns, all provide effective mechanisms that help tackle some of the structural and systemic barriers mentioned above.

### **Apps for Latinx Populations: Interest and Engagement**



Research studies have suggested a lack of data on whether apps are an acceptable method of help-seeking, including use, engagement, and overall long-term benefits. Contrary to belief, self-help applications have been proven to effectively reduce depressive symptoms and stigmatization (Griffiths & Christensen, 2007). Mobile mental health apps increased in popularity during the pandemic, as many individuals sought to find mental health care with easy and fast accessibility (Figueroa & Aguilera, 2020). The Latinx population is often underrepresented in mental health care and has historically been a difficult population to recruit into clinical trials (Pratap et al., 2018). Major challenges in recruitment often fail to show results that are representative of the Latinx population, in fact, the few studies that exist indicate a quick decline in app engagement, the higher cost, and effort necessary to recruit Hispanic participants compared to non-Hispanic participants (Muñoz, Camacho, & Torous, 2021; Pratap et al., 2018). Pratap and colleagues lead a study to assess the engagement levels of active mental health app users within the Latinx Community. Their study found that fully remote mobile-based studies attract diverse populations but when it came to keeping participants engaged, Latinx individuals struggled to keep long-term engagement, and engagement in a “low-touch” research study also remained a challenge (Pratap et al., 2018).

### **PURPOSE AND HYPOTHESES**

The purpose of our study was to examine whether the disparities observed in traditional mental health services persisted for a trauma-focused app that recruited participants from the 2017 Hurricane outbreak. A comparison analysis of utilization and engagement between the applications, Bounce Back Now and Enhanced Usual Care provides us with a unique perspective on approaches to addressing mental health concerns. *Bounce Back Now* is a mobile application designed to address common post-disaster mental health symptoms including posttraumatic

stress, depression, and sleep disturbance. A specific focus on geographical region provides us a unique outlook on hurricanes that made landfall in the US in 2017 and 2018 including Harvey, Irma, Maria, Florence, and Michael, given approximately half of our sample were Latinx.

*Enhanced Usual Care* acted as a control app that housed links to a compiled list of comprehensive disaster resources. It specifically mirrored a statement of research and study assessments within the BBN app. Through this analysis, our study sought to examine whether Latinx participants utilized and benefited from the app at similar rates compared with non-Latinx participants. Findings will help us better understand future approaches that will address structural and systemic barriers that prevent Latinx folks from seeking or continuing to seek mental health services.

Given these prior findings, the following hypotheses were tested:

- 1) It was expected that these data would replicate prior findings that those with higher incomes would be more likely to have received mental health services in the last month when compared with those with lower incomes.
- 2) Latinx participants will report lower income compared with non-Latinx White participants.
- 3) Latinx participants will be less likely to have received mental health services in the last month compared with non-Latinx White participants.
- 4) Compared to non-Latinx White participants, Latinx participants will have higher levels of use of self-help functions within the BBN condition, which includes:
  - a. Latinx participants will log in to the app more than non-Latinx White participants.

- b. Latinx participants in the BBN condition will utilize the Activate, Write, and Sleep more than non-Latinx White counterparts, including higher rates of any use of these components and more frequent use of each.
- 5) Alternatively and because of anticipated systemic and cultural barriers, non-Latinx participants in both conditions will use the “Get Help” feature more than Latinx participants.
- 6) Two competing hypotheses were proposed about average symptomatology at baseline, as it reflects thresholds for digital help-seeking.
- a. Because of lower access to care and a higher rate of delaying care, Latinx participants will report higher levels of depression symptoms and PTSD symptoms compared to non-Latinx White participants.
  - b. Alternatively, because of lower access to care and the potential for apps to reduce these barriers, Latinx participants may engage with the app at earlier stages of symptom progression and therefore endorse lower symptoms compared to non-Latinx White participants.

The following additional research questions were explored:

- 1) We also sought to examine whether the effects of Bounce Back Now utilization on symptom improvement will differ across Latinx and non-Latinx White participants.

## **METHOD**

### **Participants**

The data for this study came from a randomized clinical trial examining the efficacy of a digital self-help tool designed to address the mental health needs of U.S. survivors of the 2017 and 2018 hurricane seasons. Participants included 1,357 adults recruited in the months after

hurricanes made landfall in their zip codes. Adults were recruited from geographic areas affected by Hurricanes Harvey (Texas, n=158), Irma (Florida, n=58), Maria (Puerto Rico, n=708), Florence (North Carolina, n=80), and Michael (Florida, Georgia, n=353). Participants ranged in age from 18-78 years (M=42.8; Mdn=43); were predominantly women (n=1,021; 75.2%); and had incomes under \$20,000 annually (44.8%).

Race/ethnicity was assessed using separate questions for Hispanic/Latinx ethnicity and race/ethnicity. Approximately half of the participants reported identifying as Hispanic/Latinx (n=672; 49.5%). Most Hispanic/Latinx participants identified racially as either White (n=278; 41.4%) or “Other” (n=299; 44.5%). The next largest categories of racial/ethnic identification were: Black/African American (n=28; 4.2%), American Indian or Alaska Native (n=11; 1.6%), or participants who did not respond to the race/ethnicity item at all (n=52; 7.7%). Non-Latinx participants (n=685, 50.5%) identified as White (n=459, 77.5%), Black/African American (n=75, 12.7%), American Indian or Alaskan Native (n=23, 3.9%), other race (n=21, 3.5%), Asian (n=4, 0.7%), or Native Hawaiian or other Pacific Islander (n=4, 0.7%).

## **Procedure**

Social media ads asked whether participants were experiencing difficulties recovering after the hurricane, including problems related to stress or other emotional difficulties. Ads also specifically referenced that the study was evaluating a tool that may help. Specific zip codes were targeted based on the level of inundation to ensure that participants were all recruited from areas that were heavily affected by the hurricane. After responding to the ad, participants were prompted to download the app where they completed informed consent and all study measures. Following consent, participants were randomized to either receive the full self-help app or an information and referral-only version of the app. Participants completed baseline assessments of

mental health symptoms, hurricane exposure, and loss, prior traumatic event exposure, healthcare access, social support, and demographics. Participants were asked to complete three additional assessments three months, six months, and 12 months after they completed the baseline assessment. Follow-up assessments addressed mental health symptoms, healthcare access, and social support. Approximately half of the participants were randomized to the experimental condition (n=361; 53.7%) but analyses here and intervention efficacy (authors blinded for review) suggest that digital health intervention was not associated with greater changes in PTSS or social support than the information-only app. Thus, the full sample was included in all analyses. All procedures were approved by the Institutional Review Board.

A population-based randomized control trial was conducted to examine the efficacy of BBN vs. EUC among adults living in geographic areas affected by Hurricane Harvey, Irma, Florence, or Maria in 2017 and 2018. Participants were recruited remotely. Study procedures were automated. Inclusion criteria were age 18, access to an internet-accessible device, English speaking, and living in a hurricane-affected area.

### **Enhanced Usual Care (EUC) App**

The EUC app housed a statement of research and study assessments mirroring those in the BBN app. The EUC app also included links to disaster assistance and disaster mental health resources consistent with content in the “Get Help” component of BBN. This included descriptions of, and access to, the Disaster Distress Helpline as well as descriptions and links to resources via the ARC, Federal Emergency Management Agency, Ready.gov, National Institutes of Health, and Centers for Disease Control and Prevention websites.

The PROMIS Depression Scale was used to assess depressive and sleep symptoms; posttraumatic stress symptoms were assessed with the PTSD Checklist. The EUC app housed a

statement of research and study assessments mirroring those in the BBN app. The EUC app also included links to disaster assistance and disaster mental health resources consistent with content in the “Get Help” component of BBN.

### **Bounce Back Now App and Components**

Bounce Back Now consists of four major components: (1) a tracking (“weekly check-up”) tool to facilitate post-disaster symptom self-monitoring; (2) education, brief coping tools, and quick tips to normalize survivors’ experience and reduce user distress in the moment; (3) self-help components (Activate, Write, Sleep) targeting mood, post-traumatic stress, and sleep symptoms; and (4) access to immediate professional support by phone and/or text via the national Disaster Distress Helpline, administered by the Substance Abuse and Mental Health Services Administration (SAMHSA), or to other external resources (e.g., links to American Red Cross, FEMA, Ready.gov, NIH, CDC). Many of the major elements of BBN were developed and tested in web-based formats in prior research. Each component is described below.

#### ***Weekly check-up***

The “weekly check-up” screener consisted of 10 questions, 6 of which were adapted from the Kessler-6, and assess feelings of depression, nervousness, avoidance, worry, hopelessness, restlessness, sleep quality, worthlessness, perceived effort burden, and distress associated with the disaster. We piloted a daily version (one item per day) of the screen with trauma patients and found that it predicted PTSD and depression 30 days post-injury. The app prompted users to complete the screen weekly and graphically displayed results to allow users to visually track their symptoms over time. Screen results guided user recommendations on the home screen (“My Plan”) such that users were advised to use (a) the Coping Tools component when they had mild symptoms (e.g., endorsed “a little of the time”); or (b) the Activate (mood), Write (PTSD,

anxiety), and/or Sleep (sleep quality) components when they had moderate or significant levels of symptoms (i.e., endorsed “some,” “most,” or “all of the time”).

### ***Coping tools***

Psychoeducation and brief coping exercises were available via the Coping Tools component. Tailored education (i.e., guided by user clicks) was provided about the effects of disasters, risk factors, and common emotional reactions, and quizzes were used to guide learning. Deep breathing, progressive muscle relaxation, and mindfulness activities (~2-3 min) were guided via text or audio narration. Brief overviews of behavioral activation, writing exposure, and cognitive behavioral strategies to address sleep quality were provided via audio narration. “Quick tips” educated users about how to cope with emotional reactions (e.g., “practicing deep breathing can help to relieve stress and clear your thoughts”).

### ***Activate, Write, and Sleep components***

The Activate component was based on the Brief Behavioral Activation Treatment for Depression, an efficacious treatment for depression and comorbidities. Users were directed to identify values in five major life areas (i.e., Relationships, Education/Career, Hobbies/Recreation, Health/Spirituality, and Daily Responsibilities) and were prompted to select fun and functional activities to rate and schedule. Users initially were able to select up to three values in each life area and up to five activities relating to each value, but subsequent visits were permitted to exceed these limits. Users were prompted to rate the enjoyment, importance, and difficulty of each activity selected. Users were then encouraged to schedule activities and track completion in the app. Daily mood ratings were recorded and graphically depicted in relation to activities completed to facilitate user tracking.

The Write component included education and rationale supporting the benefits of writing exposure, based on expressive writing paradigms including Written Exposure Therapy, a brief efficacious intervention.<sup>cc,cd,ce</sup> Users were advised to write for 30-minute periods about their most upsetting event on five separate occasions, once or twice per week. The app provided a timer, assisted in scheduling these sessions, and encouraged the use of pen and paper, rather than word processing software or other technology. Users were given recommendations to begin immediately but were permitted to schedule their initial writing session for a later time. Motivational enhancement content was provided to users who delayed or did not complete the writing tasks. Instructions for “sessions” 2-5 emphasized the importance of writing for 30 minutes and focusing on the most distressing parts of the event.

The Sleep component was based on Cognitive Behavioral Therapy for Insomnia (CBT-I), an efficacious treatment for insomnia and related sleep disorders. Users were provided education about sleep, common sleep problems, and sleep hygiene. Users were prompted to complete a sleep log of the times they went to bed, fell asleep, woke up, and left the bed, and reported how much time they spent awake during the night. Recommendations to improve sleep efficiency (i.e., proportion of time sleeping to time spent in bed), were tailored based on users’ sleep logs. The app suggested daily wake times and earliest bedtimes, and automated adjustments to these times following CBT-I recommendations. Graphical depictions of sleep data allowed users to track current status and changes over time.

### ***Access to professional support***

The “Get Help” component provided brief education about various mental health resources and services as well as access to professional care. The principal focus was the Disaster Distress Helpline, a SAMHSA-administered national helpline dedicated to year-round



crisis counseling for anyone in distress before, during, or after a disaster. Crisis counselors at the Disaster Distress Helpline are available by text or phone, in English or Spanish, daily and around the clock to provide crisis intervention and/or local referrals to mental health services. The “Get Help” component also provided links to the American Red Cross (ARC), Federal Emergency Management Agency, Ready.gov, National Institutes of Health, and the Centers for Disease Control and Prevention.

## **Measures**

***Application Use.*** Use for each participant was automatically tracked for each component of BBN. BBN use passively tracked the number of logins to BBN and treated it as a continuous variable that quantified the number of times a participant opened and entered the application after it had been closed. Tracking also consisted of access to BBN modules within the app that were treated as dichotomous variables indicating whether participants accessed varying modules (0 = did not access; 1 = accessed). Access to BBN modules included a range of pages, checkups, activity selections, activity scheduling, and reporting on how many times specific activities were completed.

***Depression Symptoms.*** The Patient-Reported Outcomes Measurement Information System (PROMIS) – Depression Scale (version 8a) is an 8-item measure of depressive symptoms (DSM-5) that uses a 5-point Likert scale format with scores ranging from 8-40.

***PTSD Symptoms.*** PTSS were examined using the PTSD Checklist for DSM-5 (PCL-5; Blevins et al., 2015). The PCL-5 is a 20-item questionnaire based directly on DSM-5 symptom criteria for PTSD (American Psychiatric Association, 2013). Each symptom is rated from “Not at all” (0) to “Extremely” (4). There are multiple approaches to scoring the PCL-5. The total score is used here, which is computed by summing responses to each symptom with possible scores

ranging from 0 to 80. While not a formal diagnosis, prior research has supported a total score cutoff of 31-33 as indicative of clinically elevated symptoms (Blevins et al., 2015). The PCL-5 has also demonstrated strong internal consistency and test-retest reliability (Blevins et al., 2015). In this study, internal consistency was also very good at each wave (Cronbach  $\alpha > .95$  for each wave).

***Mental Health Service Utilization.*** Mental Health Service Utilization was examined using two questions. The first asked participants if “during the past month they’ve taken any medication to help with emotions, concentration, behavior, or mental health during the past month” (Yes/No) and the second asked participants if “during the past month if they’ve received counseling, therapy, or other non-medication treatment from a mental health care professional” (Yes/No). Mental health services within the last month were treated as dichotomous variables indicating (0 = No; 1 = Yes).

***Demographics.*** Race/ethnicity was examined using two questions. The first asked participants to identify whether they were “Hispanic or Latino” (Yes/No) and the second asked participants to select their racial/ethnic identity as “White”, “Black or African American”, “Asian”, “American Indian or Native Alaskan”, “Native Hawaiian or Pacific Islander”, “Other” or “Prefer not to answer”. Gender was assessed as “male”, “female”, “other”, or “prefer not to respond”. As a result, it is unclear how many participants may have identified within each category who were transgender, non-binary, or gender diverse in an additional way. Age, years of education, and annual household income were also assessed.

## **RESULTS**

### **Predictors of Formal Mental Health Service Access**

In testing hypotheses 1 through 3 regarding mental health service access over the past month, Latinx participants were less likely to have received “talk therapy” than non-Latinx participants in the past month (aOR = 0.65,  $b = -.428$ ,  $SE = .146$ ,  $p = .003$ ). There were no significant differences, however, in the rate with which the two groups reported receiving medication for mental health difficulties over the past month (aOR = 1.19,  $b = -.176$ ,  $SE = .116$ ,  $p = .130$ ).

Latinx participants reported higher income than non-Latinx White participants ( $b = -.721$ ,  $SE = .059$ ,  $p = .001$ ). Conversely, Latinx participants reported lower education compared to non-Latinx White participants ( $b = .284$ ,  $SE = .088$ ,  $p = .001$ ). After controlling for income and education, racial/ethnic differences were no longer significant for talk therapy ( $b = -.428$ ,  $SE = .146$ ,  $p = .003$ ). Latinx participants were more likely to have received medication than non-Latinx participants within the past month ( $b = .176$ ,  $SE = 0.116$ ,  $p = .130$ ).

## **Bounce Back Now Utilization**

### ***Utilization of Bounce Back Now Components across Latinx and Non-Latinx Participants***

Latinx participants logged in ( $b = .168$ ,  $SE = .022$ ,  $p < .001$ ), accessed quick tips ( $b = .277$ ,  $SE = .035$ ,  $p < .001$ ), accessed coping tools ( $b = .068$ ,  $SE = .012$ ,  $p < .001$ ), and accessed Get Help ( $b = .479$ ,  $SE = .050$ ,  $p < .001$ ) more often than non-Latinx participants. There were no differences in access for the MyPlan components ( $b = .110$ ,  $SE = 0.077$ ,  $p = .150$ ) or in access of Activate ( $b = .017$ ,  $SE = .094$ ,  $p = .859$ ) between Latinx and non-Latinx participants.

Those with recent access to mental health services logged in less often ( $b = -.183$ ,  $SE = .028$ ,  $p < .001$ ) and utilized the coping tools ( $b = -.137$ ,  $SE = 0.017$ ,  $p < .001$ ) and Get Help features less often ( $b = -.208$ ,  $SE = .069$ ,  $p = .002$ ). No other component differences were observed ( $p$ -values  $> .05$ ). Those with recent use of medication for mental health logged in more often ( $b = .219$ ,  $SE$

= .022,  $p < .001$ ) but used quick tips less often ( $b = -.115$ ,  $SE = .036$ ,  $p = .002$ ). No other use differences were observed.

### ***Baseline Comparisons across Latinx and Non-Latinx Participants***

Latinx participants reported higher baseline symptoms across all three outcomes, as did those who reported receiving services in the last month, and those with lower income (income is negatively associated with baseline symptoms). Age was positively associated with depression ( $b = -.049$ ,  $SE = .020$ ,  $p = .013$ ), but negatively associated with sleep difficulties ( $b = .045$ ,  $SE = .019$ ,  $p = .020$ ). Education was negatively associated with depression ( $b = -.827$ ,  $SE = .607$ ,  $p = .173$ ) and sleep ( $b = -.444$ ,  $SE = 0.266$ ,  $p = .095$ ).

### **Exploring Symptom Change Differences**

Analyses of treatment outcome differences across Latinx and non-Latinx participants suggested there was not a significant difference in app efficacy for depression ( $b = 0.635$ ,  $SE = 1.279$ ,  $p = .619$ ).

## **DISCUSSION**

The purpose of our study was to examine whether the disparities observed in traditional mental health services persisted for a trauma-focused app that recruited participants from the 2017 Hurricane outbreak. Through this analysis, our study sought to examine whether Latinx participants utilized and benefited from the app at similar rates compared with non-Latinx participants. Hypotheses 1-3 posited participants with formal mental health services would have higher income, whereas Latinx participants would report lower income, and Latinx participants would be less likely to have received any prior mental health service in the last month compared to non-Latinx White participants. Through the tracking of previous mental health services within the past month, we found Latinx participants were less likely to receive “talk therapy” whereas

both Latinx and non-Latinx White participants reported receiving medication for mental health. When we looked at income and education, Latinx participants reported higher income and lower education compared to non-Latinx White participants. When both variables were controlled, receiving “talk therapy” within the past month was no longer significant across both groups, but Latinx participants were more likely to have received medication than non-Latinx White participants within the past month. We found support for our fourth hypothesis, that Latinx participants would have higher engagement and more frequent use of Bounce Back Now self-help components except in the “Get Help” feature, which happened to be our fifth hypothesis. Findings indicate to be true aside from access in MyPlan components or access of Activate between both racial groups. We also found support for our sixth hypothesis, Latinx participants will report higher levels of depression symptoms and PTSD symptoms due to lower access to care and a higher rate of delay in care compared to non-Latinx White participants. Results indicate Latinx participants reported higher baseline symptoms across all three outcomes and the same findings in those who reported receiving services in the last month. Alternatively, due to lower access to care and the potential for apps to reduce these barriers, we hypothesized Latinx participants' engagement with the app at earlier stages of symptom progression and therefore endorse lower symptoms compared to non-Latinx White participants. Results indicate lower income was negatively associated with baseline symptoms, education was negatively associated with depression and sleep, and age was positively associated with depression and negatively associated with sleep difficulties. An additional question we had was to note differences, if any, in treatment efficacy across Latinx and non-White participants. Analyses of treatment outcome differences across Latinx and non-Latinx participants suggested there was not a significant difference in app efficacy for depression.

### *Comparison of Utilization of Bounce Back Now Components*

Supporting Hypothesis 4, Latinx participants engaged with multiple components of the app at a higher rate than non-Latinx participants. There was no app component with which non-Latinx participants engaged more than Latinx participants. Findings that Latinx participants engaged more frequently with the app than non-Latinx participants may be a result of the numerous structural and systemic barriers that exist when seeking care amongst the Latinx population. Lower rates of seeking mental health services due to lack of insurance, high and hidden costs, lack of availability of culturally and linguistically appropriate services, and sociocultural barriers to care, may potentially lead many individuals to seek other outlets that can address these barriers. This suggests that those interested in help-seeking still face difficulties as they search for other alternatives to address their mental health concerns. In fact, with a high number of help-seeking participants, we can safely assume that many are still seeking help in any capacity, even if it is available through varying forms of technology tools (i.e., telemental health, internet-based self-help applications, etc.) (Ralston, Andrews, & Hope, 2019). A factor for seeking other non-traditional forms of care can be accessibility, stigma-related barriers, and language barriers among other structural barriers. Contrary to the belief that Latinx individuals are not seeking services, our findings indicate a high need for interest and initiative that can be addressed through mental health applications.

Our findings indicate participants with recent access to mental health services logged in less often and utilized coping tools and the Get Help features less often. This finding may indicate that individuals who have already sought some form of mental health service may or may not find certain features within mental health applications useful because they have already been provided some sort of coping tools to help address their mental health concerns. On the other

hand, given the lower rate of mental health service access for Latinx participants, we can safely assume they will be more likely to engage with app components, evident in our findings for Hypothesis 4. Although limited, prior studies have found great benefits in utilizing mental health services, like applications, to help provide immediate care and resources to individuals who may have mental health concerns. Our findings replicate these findings through the high engagement of Latinx participants across varied app components of the Bounce Back Now application.

### ***Baseline Comparisons***

In support of Hypothesis 6, potentially because of lower access to care and a higher rate of delaying care, Latinx participants reported higher levels of depression and PTSD symptoms compared to non-Latinx White participants at baseline. This means that Latinx individuals seek care at severe stages and therefore, once they are seen by a mental health care provider, they are not only more advanced in the severity of their illness but are more at risk for long-term effects. As a reminder, our data sample includes participants that are considered help-seeking, therefore they already have the intention to seek some kind of care. As previously discussed, delayed care can be due to several factors including stigma, lack of health literacy, and structurally embedded in receiving and the availability of culturally and linguistically appropriate services.

### **Strengths and Limitations**

Our study has multiple strengths including the high number of help-seeking participants in our sample and our approach of tracking self-help components used to measure engagement and utilization based on each participant's own initiatives to address their mental health concerns. While the current study provided evidence for the potential benefit of wider dissemination of mobile applications among Latinx populations multiple limitations need to be addressed. First, our sample is predominantly Puerto Rican. Therefore, it likely does not generalize to other

Latinx populations. Further over 75% of our sample were women. As a result, findings are limited in the generalizability for men. Also, all participants had to respond to an ad about a mental health resource to be included in the study and were therefore already willing to seek help for mental health. Finally, the Bounce Back Now application was only available in English. This excludes all participants who may not speak English or do not feel comfortable operating an app in English. Thus, the groups who experience the most significant barriers to care (i.e., those with limited English proficiency, such as immigrants) would not have been able to fully participate.

### **Conclusion**

Our current study demonstrates high engagement and application utilization among help-seeking participants interested in further addressing their mental health concerns. Meaning, participants are not only interested in addressing their mental health concerns through means of technology but are utilizing the self-help components and resources these mobile apps provide. Our findings indicate Latinx participants used the self-help app components more often than non-Latinx White participants indicating high interest and engagement. Baseline comparisons indicated Latinx participants reported higher baseline symptoms across depression, PTSD, and sleep difficulties. This indicates Latinx participants are more likely to seek mental health care services at more severe stages than their counterparts. There are numerous factors and implications to delayed care. If care is sought at later stages, it might mean the effects are greater and more detrimental which can indicate more treatment is needed and higher cost of service, a barrier that impedes many Latinx folks to seek care in the first place. Analyses of treatment outcome differences across Latinx and non-Latinx participants suggested there was not a significant difference in app efficacy for depression. This means both racial groups were not equal, but differences weren't significant either.



These results highlight the importance of making mental health apps available to Spanish-speaking communities. High utilization and engagement indicate a high need for mental health applications among Latinos and therefore should be made available for use with Spanish operability. Given that Latinx participants reported higher baseline symptoms than non-Latinx Whites, we should keep in mind that many Latinos are not seeking care early and therefore should be provided with a resource with easier accessibility that helps tackle systemic barriers embedded in our current mental health services. These findings highlight the importance of providing better availability and dissemination of apps for Latinx populations (e.g., more bilingual apps).

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Table 1. Descriptive and Participant Background Information

	<i>M or N</i>	<i>SD or %</i>
Age	42.8	
Women	1,021	75.2%
Hispanic/Latinx	672	49.5%
White	278	20.3%
Black/African American	28	2.0%
American Native/Alaska Native	11	0.8%
Other	299	21.8%
Native Hawaiian/Pacific Islander	4	0.3%
Not reported	52	3.8%
Not Hispanic/Latinx	592	50.5%
White	459	33.5%
Black/African American	75	5.5%
American Native/Alaska Native	23	1.7%
Other	21	1.5%
Asian	4	0.3%
Native Hawaiian/Pacific Islander	4	0.3%
Not reported	6	4.4%
Did not report ethnicity	93	6.9%
Hurricane		
Harvey	158	11.5%
Irma	58	4.2%
Maria	708	51.6%
Florence	80	5.8%
Michael	353	25.7%
Education		
Less than high school graduate	61	9.7%
High school graduate/GED	202	14.9%
Some college	509	37.5%
College graduate	307	22.6%
Some graduate school or higher	207	15.3%
Not reported	71	5.2%
Annual household income		
Less than \$10k	287	21.1%
\$10k to less than \$20k	321	23.7%
\$20k to less than \$40k	298	22.0%
\$40k to less than \$60k	148	10.9%
\$60k to less than \$80k	90	6.8%
\$80k or more	70	5.2%
Not reported	141	10.4%
PTSD baseline symptoms (PCL-5)	37.20	18.90
Depression baseline symptoms (PROMIS 8a)	23.45	8.94

Sleep difficulty baseline symptoms (PROMIS 8a)	27.64	8.55
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Table 2. Descriptives of comparisons among Latinx and Non-Latinx Participants

Note: \*Latinx participants evidenced significantly higher scores than non-Latinx participants ( $p$ -

	<i>Latinx</i>		<i>Non-Latinx Whites</i>	
	M or N	SD or %	M or N	SD or %
Utilization of BBN Components				
Logins*	14.75	24.33	18.92	29.99
Accessed Coping Tools*	26.86	80.67	28.08	70.53
Accessed Get Help Feature*	1.36	3.64	2.28	9.13
MyPlan Components	0.72	0.95	0.72	1.01
PTSD baseline symptoms (PCL-5)*	35.72	18.78	38.59	18.94
Depression baseline symptoms (PROMIS 8a)*	22.08	8.94	25.03	8.72
Sleep difficulty baseline symptoms (PROMIS 8a)*	26.55	9.04	28.84	7.83
Mental health services within last month				
Talk Therapy†	152	22.6%	94	15.9%
Medication	262	39.0%	255	43.1%

values < .05). †Non-Latinx participants evidenced significantly higher scores than Latinx

participants ( $p$ -values < .05). All comparisons were made with age, education, and income as

control covariates.