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Los Angeles

Digital Mental Health Interventions for College Students of Color:

Understanding Uptake and Enhancing Engagement

A dissertation submitted in partial satisfaction

of the requirements for the degree

Doctor of Philosophy in Psychology

by

Tamar Aliza Kodish

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ABSTRACT OF THE DISSERTATION

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Doctor of Philosophy in Psychology

University of California, Los Angeles, 2021

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College students of color represent a large and growing segment of the U.S. college student population, but attention to their specific mental health needs and responses to intervention have been largely overlooked (Banks et al., 2020). Evidence illustrates that students of color experience elevated mental health problems, and that racial/ethnic disparities in mental health treatment receipt among college students are rampant (Lipson et al., 2018). The dual pandemic (i.e., COVID-19 and systemic racism) has disproportionately impacted the mental

health of students of color, exacerbating preexisting inequities in mental health problems and treatment (Lederer et al., 2020; Zimmerman et al., 2020; Molock & Parchem, 2020). Students of color have exhibited higher rates and greater increases of mental health concerns during the pandemic compared to their white peers (Kim et al., 2021; Fruehwirth, Biswas & Perreira, 2021; Browning et al., 2021), secondary to a host of psychosocial sequelae, such as disruptions in living situations, financial strain, changes in academic functioning, and experiences of racism and discrimination (Molock & Parchem, 2020). Yet, students of color remain less likely to receive mental health care compared to their white peers (Lin et al., 2022). Given students of color are a high need, understudied, and underserved group, increased attention to their mental health needs and the development of innovative strategies targeting mental health equity are imperative.

Universal online screening and the use of digital mental health interventions (DMHI) to deliver treatment to college students of color have been proposed as mechanisms for disparity reduction, and research indicates DMHI are effective in college student populations (Lattie et al., 2019). However, less is known about DMHI preferences, needs, and usage among students of color, and poor user engagement with DMHI remains a pressing concern overall, even amid increased use of technology to provide students with mental health care during the pandemic (Lattie et al., 2021; Liu et al., 2020). Prior studies on DMHI engagement tend to emphasize barriers to sustained engagement once users have initiated use of programs, and engagement strategies have therefore focused on enhancing retention (Torous et al., 2020). There remains a substantial gap in our understanding of DMHI uptake, or initial use, a requisite step to longer-term engagement, retention, and benefit.

Addressing pertinent questions about DMHI reach and uptake for college students of color can support efforts to advance health equity in this population. The goal of this dissertation was to explore the following research questions: (RQ1) Can DMHI enhance racial/ethnic equity in college student mental health treatment receipt? (RQ2) What are the key barriers to DMHI uptake for college students of color and what strategies might enhance DMHI uptake in this population?

Study 1 addressed RQ1, through evaluating racial/ethnic differences in mental health problems and treatment enrollment within the context of a largescale screening and treatment research initiative on a diverse college campus. This initiative included online student mental health screening and a tiered-care treatment model, with tiers of: behavioral health tracking for students with no symptoms, online therapy with coaching support for those with mild-severe anxiety or mild-moderate depression, and face-to-face personalized treatment for those with severe depression or suicide risk. The current study included n=2,090 students who completed the online screener within the study timeframe (April 2018-February 2020), of whom n=1,695 (81.1%) were eligible for and offered online or face-to-face treatment through the research initiative. Results illustrated racial/ethnic differences in depression, anxiety and suicidality endorsed in the screening survey. Students of color were less likely to have received prior mental health treatment compared to white students but were no less likely to enroll in and initiate digital and face-to-face treatment offered through the research initiative. Rates of enrollment in the DMHI were comparable to prior studies and reflect significant room for improvement, with just 8.7% of those eligible initiating use of the DMHI. While findings demonstrate that online screening and DMHI have the potential to reduce racial/ethnic disparities in treatment use, most students still do not use DMHI when offered.

The findings of Study 1 underscored the importance of examining RQ2 through the use of a modified Delphi study to generate expert consensus on barriers to DMHI uptake and strategies to improve uptake among college students of color. Cross-disciplinary experts (n=35) from four groups participated, including scientists with expertise in (1) DMHI with racial/ethnic minorities (n=7), (2) DMHI with college students (n=10), (3) racial/ethnic minority mental health (n=11), and (4) DMHI industry professionals (n=7). Over the three-round survey, experts identified important barriers to uptake, including factors associated with the user, program, technology, and environment. The strategies ultimately nominated were coded within four levels of implementation, including DMHI design, DMHI marketing and outreach, DMHI orientation and onboarding and campus and community-level efforts. Analyses yielded a subset of promising strategies that were rated highly on importance and feasibility. These findings may provide guidance for future efforts focused on tailoring, augmenting, and implementing DMHI uptake strategies through a process of co-creation with students of color as engaged stakeholders.

Findings from this dissertation are salient now more than ever, given the enduring detrimental effects of the twin pandemic on college student mental health and the coinciding evolution of our mental health service infrastructures. With increased reliance on technology to deliver mental health resources and treatments, an improved understanding of how these tools can be designed, tailored, and implemented to enhance racial equity is crucial. Together, these studies have translational potential to improve access and quality of mental health care for marginalized college students of color.

The dissertation of Tamar Aliza Kodish is approved.

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**Study 1: Enhancing Racial/Ethnic Equity in College Student Mental Health Through
Innovative Screening and Treatment**

Abstract

Purpose. Although college campuses are diversifying rapidly, students of color remain an underserved and understudied group. Online screening and subsequent allocation to treatment represents a pathway to enhancing equity in college student mental health. The purpose of the current study was to examine racial/ethnic differences in mental health problems and treatment enrollment within the context of a campus-wide screening and treatment research initiative at a large and diverse public university.

Methods. The sample was comprised of $n=2,090$ college students who completed an online mental health screening survey and were offered either free online or face-to-face treatment based on symptom severity as a part of a research study. A series of ordinal, binomial and multinomial logistic regression models were specified to examine racial/ethnic differences in mental health problems, prior treatment receipt, and enrollment in digital and face-to-face treatment through the campus-wide research initiative.

Results. Racial/ethnic differences in depression, anxiety and suicidality endorsed in the screening survey were identified. Students of color were less likely to have received prior mental health treatment compared to non-Hispanic white students, but were no less likely to enroll in and initiate digital and face-to-face treatment offered through the current research initiative. Rates of enrollment in online therapy were comparable to prior studies.

Conclusions. Online screening and treatment may be an effective avenue to reaching underserved students of color with mental health needs at rates comparable to majority students. Digital mental health tools hold promise for promoting equity in care, however, the low rates of uptake across groups highlight an urgent need to design and evaluate strategies to improve uptake and engagement to decrease mental health burden on college campuses.

Introduction

Mental illness among college students is a public health crisis, with rates of depression and anxiety more than doubling over the past decade. In 2019, 42.2% of U.S. college students reported feeling so depressed it was difficult to function, and 63.6% of college students reported experiencing overwhelming anxiety (Duffy et al., 2019). Almost one in four college students have experienced suicidal ideation in their lifetime (Mortier et al., 2018). In the face of exploding mental health need on college campuses, counseling centers have observed large increases in treatment seeking (Xiao et al., 2017). Despite efforts to respond to increased demand, many campuses lack sufficient resources to support student mental health needs (Watkins, Hunt & Eisenberg, 2012). This shortage, compounded by a myriad of barriers to mental health services (e.g. stigma, limited financial resources, lack of time), has left the majority of college students suffering from mental health concerns without treatment (Miranda et al., 2015; Downs & Eisenberg, 2012). Improved understanding of student mental health needs and patterns of service use on diverse college campuses is needed to begin bridging gaps in unmet need for care.

To date, the majority of our knowledge about mental health problems and treatment on college campuses is derived primarily from non-Hispanic white (NHW) samples of students. For example, two of the largest nationally conducted studies, the National College Health Assessment (NCHA), and the Healthy Minds Study (HMS), were composed of 72% and 74% NHW students, respectively (Duffy et al., 2019). Despite this representation in recent studies, NHW college students currently comprise just 54.8% of the U.S. college student population (Espinosa et al., 2019). Although the extant literature includes predominantly NHW college student samples, the percentage of American college students of color is increasing, whereas the proportion of NHW students is decreasing. From 1976 to 2016, the percentage of Latinx students

in the U.S. postsecondary student population grew from 4% to 18%, and the percentage of Black students increased from 10% to 14%. Asian American enrollment also increased more than threefold within this timespan. Across this time, the percentage of NHW college students fell from 84% to 57% (U.S. Department of Education, 2018). Given these demographic shifts, increased attention to the mental health and service use of racial/ethnic minority college students is needed.

Currently, less is known about mental health problems and service use among college students of color relative to their non-Hispanic white counterparts. Some data suggest that students from some racial/ethnic minority groups experience elevated depression, anxiety and suicide risk when compared to NHW students or all other students in college samples (Lipson et al., 2018; LeSure-Lester & King, 2004; Liu et al., 2019). For instance, the largest recent study evaluating mental health disparities among college students of color found that Asian American, Latinx, and Multiracial students were more likely to have clinically elevated depression symptoms when each group was compared to all other students. This study also found that Multiracial students experienced elevated anxiety and higher suicide risk relative to all other groups, while African American and Asian American students were less likely to have clinically elevated anxiety (Lipson et al., 2018). Factors contributing to mental health problems among college students of color have also been identified, including experiencing microaggressions, discrimination, imposter syndrome, and negative campus climate (Prelow, Mosher & Bowman, 2006; Nadal et al., 2014; Hwang & Goto, 2008). However, several prior studies have found no evidence of racial/ethnic differences in mental health concerns among college students (Eisenberg et al., 2007, Mokrue & Acri, 2014). Given the mixed nature of prior findings, additional research is needed to delineate disparities in mental health problems among college

students of color. Another limitation of the extant literature is that many studies comprise small groups of racial/ethnic minority students, compared to larger NHW groups (Lipson et al., 2018). In addition, most prior studies have evaluated differences in prevalence of mental health problems, often using established cutoff scores to characterize absence or presence of anxiety and depression (Lipson et al., 2018). Studies that evaluate differences in severity of mental health concerns among diverse students have been less frequently conducted and can be helpful in providing more nuanced clinical information to inform levels of need and treatment allocation. To improve our understanding of mental health needs on the growing number of college campuses that serve largely students of color, samples that reflect the representation of our increasingly diverse college student population are essential.

College campuses have been considered places where disparities in mental health care could be attenuated, because many institutions provide on-campus mental health services and students have relatively high rates of insurance coverage, decreasing practical barriers to care access (Eisenberg et al., 2016; McIntosh, Compton & Druss, 2012). However, a multitude of barriers to services for college students of color remain, contributing to persistence of observed racial/ethnic disparities on college campuses (Hunt et al., 2015; Lipson et al., 2018). Commonly endorsed obstacles to mental health treatment for students of color include financial concerns, a lack of time for treatment, a lack of perceived need for treatment, and stigma (Miranda et al., 2015; Lipson et al., 2018). Indeed, many studies illustrate that students of color are less likely to receive mental health services than NHW students, and when they do, they more likely to drop out of treatment early (Hunt et al., 2015; Kearney, Draper, Baron, 2005). In a recent study, 45.5% of NHW students with mental health needs received past-year treatment, compared to only 33% of Latinx, 25% of African American, and 18.9% of Asian American students (Lipson

et al., 2018). Persistent inequities in care receipt on college campuses underscore the need to delineate mental health problems and treatment use among college students of color, and implement innovative strategies that can bridge gaps in care for traditionally underserved groups.

Strategies for Reducing Unmet Need and Disparities. One proposed pathway to enhancing equity in mental health care in college settings is through online screening and digital mental health interventions (DMHI) (Muñoz et al., 2010; Schueller et al., 2019; Lattie, Lipson & Eisenberg, 2019). Provision of online mental health screening and treatment is considered an advantageous method for reaching college students in general, many of whom report a lack of time and perceived inconvenience for face-to-face services, but express high levels of comfort and acceptance of technology (Healthy Minds Study, 2019; Lattie, Lipson & Eisenberg, 2019). Some research also suggests college students of color in particular report a preference for online screening and interventions, highlighting the unique potential for DMHI to engage populations with historically lower rates of treatment seeking in care (Lungu & Sun, 2016; Dunbar et al., 2018). In addition, online screening and interventions have potential to directly address well-documented barriers to care, such as stigma and lack of time.

To date, there is no evidence to suggest that universal screening for mental health problems can directly result in reductions in racial/ethnic disparities in mental health service use (Guo, Kim, Bear & Lau, 2017). Furthermore, no known studies have tested the effect of universal screening on disparity reduction on college campuses. To achieve intended effects on disparity reduction, screening efforts may consider involving providing personalized feedback about self-reported symptom profiles, and stigma can be mitigated by enabling students to access screening and intervention resources in private on personal electronic devices (Yorgason, Linville & Zitzman, 2008). Though these strategies can promote engagement among all college

students, ethnic minority students endorse more treatment barriers and report lower rates of help-seeking and service use relative to NHW students (Eisenberg et al., 2011; Miranda et al., 2015). Thus, online screening and intervention may be a particularly promising avenue to reducing racial disparities in care.

Furthermore, despite their potential to circumvent barriers and increase care access for marginalized groups, the success of DMHI is consistently constrained by limited user uptake and engagement (Torous et al., 2018; Lattie et al., 2019). Studies of DMHI among college students have suffered from low rates of recruitment, pointing to concerns regarding feasibility and acceptability of these programs (Levin, Hicks & Krafft, 2020). One study found that just 7% of college students reported having used mental health apps, and of these, only 24% continued using the app for four weeks or longer (Kern et al., 2018). Although many have cited the potential of DMHI to reduce disparities, college students of color students remain underrepresented in the literature on digital mental health (Knowles et al., 2014). To our knowledge, there is no evidence about whether these tools can successfully alleviate the disparities frequently observed in traditional care delivery settings (Lattie et al., 2019; Ramos & Chavira, 2019). Additional research is needed to understand diverse student mental health needs and examine whether disparities in DMHI uptake exist when these programs are made available and accessible to students.

Study Aims. The current study aims to address these gaps by evaluating racial/ethnic differences in mental health problems and treatment uptake within the context of a large research and treatment initiative, University of California, Los Angeles (UCLA) Depression Grand Challenge (DGC) Screening and Treatment for Anxiety and Depression (STAND) program. The overarching goal of the STAND program is to provide comprehensive screening and treatment to

students with mental health needs, primarily in domains of depression, anxiety and suicidality. Two research questions are explored in the current study.

(1) Are there racial/ethnic differences in mental health problems (depression severity, anxiety severity, suicidality), and reported history of mental health treatment within a diverse sample of students who completed a mental health screening survey?

(2) Among students who took the screening survey and were eligible for free, online therapy or face-to-face treatment (depending on severity level), are there racial/ethnic differences in rates of treatment enrollment and treatment initiation?

Method

Data for this study were drawn from the UCLA STAND research initiative (<https://www.stand.ucla.edu/>). UCLA is a large, public university serving a racially/ethnically diverse student population. The STAND program involves two core components within the scope of a series of research studies: screening and treatment. First, all registered UCLA students were eligible to complete an online screening survey including demographics and assessment of mental health symptoms (described in detail below under “Screening”). After students completed the screener, they were provided with information about their mental health symptoms and if eligible, were offered free mental health treatment corresponding to their symptom level within a four-tiered treatment design. Those with no depression or anxiety were offered behavioral health tracking only (Tier 0). Those with mild depression or anxiety were offered a 6-module internet-based cognitive behavioral therapy (iCBT) program with certified peer support in adjunctive coaching sessions (Tier 1). Those with moderate depression or moderate to severe anxiety were offered the same iCBT program with an advanced certified peer support (Tier 2). Those with severe depression or suicide risk were offered face-to-face gold standard evidence-based

treatment, tailored to their presenting needs, within the STAND program. Face-to-face services included evidence-based psychotherapy with or without pharmacotherapy, provided by clinical psychology graduate students or postdoctoral fellows (supervised by licensed clinical psychologists), and psychiatry residents (supervised by attending psychiatrists). Treatment was provided for up to 10 months, with an average length of ~12 weeks. All research procedures were approved by the UCLA Institutional Review Board.

Participants

Eligible participants for the screening survey included all registered, matriculating UCLA students ages 18-65 with English proficiency. Data in the present study are drawn from the period April 2018 – February 2020. This timeframe was selected because demographic information on student race/ethnicity was collected within the screening survey within this period. The study period also concluded before the campus closure in March 2020 due to the COVID-19 pandemic. Students were invited to participate in the screening through a number of methods within a campaign to raise awareness about depression, including through print/online flyers distributed at various campus locations, advertising on social media, emails sent out from the Registrar's office and campus departments, recruitment messages on UCLA websites, and STAND program staff participation in campus events. Figure 1 displays the consort flow that illustrates the derivation process for the current study sample. Within the study timeframe, a total of 4,113 screening surveys were initiated, with 434 students taking the survey more than once. For these n=434 students, a rule was created by which their first screening encounter was used, unless they enrolled in treatment at subsequent screening encounter, in which case that encounter was used in the current study. Of the 3,679 unique screens, 2,473 students (67.2%) completed the entire screener. Chi-square analyses indicated no racial/ethnic differences in screener initiation

vs. completion $\chi^2 = 6.91$, $df = 1$, $p = 0.23$. Of the 2,473 students who completed the screener, a total of 383 were excluded due to missing data on race/ethnicity. Thus, final screening sample size of participants in the present study was $n = 2,090$.

Screening Procedures. Students first completed a number of eligibility questions (e.g., age, English fluency), items assessing history of mental health diagnoses and treatment, and demographic questions (race/ethnicity, sex, gender identity). Next, students completed the Computerized Adaptive Test – Mental Health (CAT-MH) (Gibbons et al., 2012, 2013, 2014, 2016, 2017), an adaptive questionnaire designed to rapidly and reliably assess mental health symptoms in domains of depression, anxiety, suicidality and others (described in measures section). The CAT-MH has consistently demonstrated high validity and reliability across a multitude of settings (Gibbons & DeGruy, 2019). Students were allowed to take the mental health screening survey an unlimited number of times, at least two weeks apart.

Treatment Procedures. After completing the screening survey, students were directed to a webpage that provided them with personalized feedback on their symptoms and information about treatment tier eligibility. Students eligible for Tiers 1 and 2 (mild to moderate depression, or mild to severe anxiety) were provided with a link that enabled them to review the consent form for the online therapy study, enroll in the treatment study, and sign up for an orientation led by a certified peer coach. Participants who attended orientations were then provided with an account and login permissions to the internet-based cognitive behavioral therapy, This Way Up (TWU; Newby et al., 2013; Newby et al., 2014). The TWU Mixed Anxiety and Depression Course was utilized in this study, and is comprised of six online modules, and participants were allotted 8 weeks to complete all modules. Participants in Tier 1 and 2 were offered support from peer coaches, provided via 30-minute weekly coaching sessions intended to review application

of module content, troubleshoot and provide motivational support. Students who opted into coaching (78.3%) were assigned a coach and scheduled for their first meeting with their coach during the orientation visit.

Students eligible for Tier 3 face-to-face treatment (severe depression or suicide risk) were contacted via telephone by a member of the research team to invite them to participate in the Tier 3 face-to-face treatment study within 24 hours after completing screening. Additional inclusion criteria were evaluated at this phone call, including: internet access, agreement to establish long-term care with an external provider if indicated after Tier 3 treatment ended, willingness to install an app to monitor activity and behavior, agreement to participate in research study procedures including symptom assessments and blood draws, and proficiency in English. Exclusion criteria were also evaluated at this phone call and included: unstable suicidality, current substance abuse interfering with treatment, primary diagnosis of psychosis unrelated to depression, neurological conditions, severe uncontrolled medical conditions, cognitive impairment, and current treatment by psychologist/psychiatrist that would not be discontinued for the course of Tier 3 treatment. Eligible participants were scheduled for a baseline visit to complete a variety of research assessments and an evaluation by a clinical psychology assessor. Following this, participants were assigned a clinician and weekly, face-to-face treatment began.

Measures

Race/Ethnicity. Students responded to a question identifying their racial background in the screening survey (“What race to you consider yourself to be?”). They were provided a list of 19 responses in checkbox format consistent with the UC Registrar item (multiple selections were allowed). Students also responded to the question “Do you consider yourself to be Hispanic/Latino?” (yes/no). A single race/ethnicity variable was created with the following

mutually exclusive racial/ethnic groups: NHW, Black/African American, Asian/Asian American, Hispanic/Latino (referred to hereafter as Latinx), Multiracial (included all those who selected more than one race, and those who identified ethnically as Hispanic and any race/ethnicity other than White), and Other (included all those who identified as belonging to another racial/ethnic group not listed on the questionnaire, in addition to those who identified as Native Hawaiian/Pacific Islander (n=2) and Native American/Alaska Native (n=6)).

Depression. Depression was measured using the Computerized Adaptive Test – Depression Inventory (CAT-DI) (Gibbons et al., 2017), which assesses several domains of depression, including mood, cognition, behavior, somatic problems, and suicidal ideation. The total item bank consisted of 389 items, and a mean of 12 items were administered per participant in the validation study (Gibbons et al., 2017). Each participant received a CAT-DI score ranging from 0-100, with 0-49 indicating minimal depression, 50-65 mild depression, 66-75 moderate depression, and 76-100 severe depression. These cut-points were empirically derived based on a mixture of normal distributions (Gibbons et al., 2012).

Anxiety. Anxiety was assessed with the Computerized Adaptive Test – Anxiety (CAT-ANX) (Gibbons et al., 2014). The full item bank consisted of 467 items, with an average of 12 items administered per participant in the validation study (Gibbons et al., 2014). Similar to depression, domains of anxiety assessed included mood, behavior, cognition and somatization. CAT-ANX scores ranged from 0-100, with scores of 0-34 indicating minimal anxiety, 35-49 mild anxiety, 50-64 moderate anxiety, and 65-100 severe anxiety. Similar to the CAT-DI, cut points were empirically derived by transforming scores from normal distributions (Gibbons et al., 2014).

Suicidality. The current study utilized a variable characterizing positive suicide screen based on responses to four items administered within the Computerized Adaptive Test – Suicide Scale (CAT-SS) (Gibbons et al., 2017). Three items assessed for presence of past month suicidal ideation, intent, and plan. One item assessed for suicidal behavior over the past three months (including attempt, aborted or interrupted attempt, and preparatory acts). Students who endorsed past-month suicidal ideation with intent or plan, or past three-month suicidal behavior were considered positive suicide screens and received outreach from the study team following a standardized risk assessment protocol. Other items from the CAT-SS have been utilized in the STAND program, but were not used in the current study.

Enrollment. Enrollment occurred once a student consented to and enrolled in the treatment study for which they were eligible after screening. For the purpose of this study, enrollment was characterized by a dichotomous variable indicating whether or not the participant was assigned a treatment study identifier.

Initial Treatment Use. Initial treatment use was measured with a dichotomous variable identifying whether or not the participant completed the first online therapy module (for Tiers 1-2) or attended an initial therapy session (for Tier 3).

These two dichotomous items were also combined to create a categorical variable of engagement, characterizing whether the participant was eligible but did not enroll (0), enrolled but did not participate in an initial treatment session, (1) or enrolled and participated in an initial treatment session (2).

Data Analytic Plan. Data were collected using REDCap (Harris et al., 2019) Statistical analyses were conducted using Stata Statistical Software – Version 14. To examine our first research question (racial/ethnic differences in depression severity, anxiety severity, suicidality

and prior treatment receipt in screening sample), two ordinal logistic regression models examined whether membership in each of the racial/ethnic minority groups was associated with differential odds of falling into a more severe category of (1) depression or (2) anxiety relative to NHW students. Ordinal logistic regression models were selected to optimize clinically meaningful interpretation of differences, given that categorical cutoffs have been empirically established for the CAT-MH (cutoffs described above). Next, binary logistic regression models were used to specify the effect of racial/ethnic group on (1) the positive suicide screen outcome, (2) prior mental health treatment receipt outcome, and (3) treatment eligibility for any treatment tier within the STAND program. All models utilized simple contrasts to compare each racial/ethnic minority group to NHW students.

To assess the second research question, binary logistic regression models were employed to evaluate the effect of race/ethnicity on initial treatment use among those who screened eligible for treatment. Three models were specified for the initial use outcome (1) across all tiers, (2) within Tiers 1-2 (online therapy) and (3) within Tier 3 (face-to-face therapy). To evaluate racial/ethnic disparities across stages (e.g. eligibility vs. enrollment, enrollment vs. initial use) a multinomial logistic regression model was used to assess the effect of race/ethnicity on a categorical treatment engagement variable. This outcome was created with values of 0 = eligible but did not enroll, 1 = enrolled but did not complete an initial treatment session, and 2 = enrolled and completed an initial session (either in person for Tier 3, or online for Tiers 1-2). The reference outcome utilized in the model was 1 = enrolled. Depression, anxiety, treatment tier eligibility (Tiers 1-2 vs. Tier 3), gender (female vs. male) were entered as covariates in the model.

Results

Descriptive Statistics. Table 1 displays the screening sample study composition compared to the university student body demographics. Inferential tests comparing the screening sample demographics to the full student body breakdown were not conducted because our screener race/ethnicity item did not differentiate between international vs. domestic students.

Racial/Ethnic Differences in Mental Health Problems and Treatment History

Depression. An ordinal logistic regression on the categorical outcome of depression revealed that Latinx (OR = 1.25, CI = 1.00-1.57, $p < .05$), and Multiracial (OR = 1.59, 1.18-2.16, $p < .01$) students were significantly more likely to be in a more severe depression category, relative to NHW students, and Black/African American students were marginally significantly more likely to be in a more severe depression category (OR = 1.48, CI = 0.97-2.26, $p < .10$). Figure 2 depicts the rates of each level of depression for each racial/ethnic group.

Anxiety. For the categorical anxiety outcome, an ordinal logistic regression revealed that Black/African American students (OR = 1.55, CI = 0.88-2.15, $p < .05$), and Latinx students (OR = 1.45, CI = 1.16-1.80, $p < .01$) were significantly more likely to be in a more severe anxiety category, compared to NHW students. Figure 3 depicts these rates for each racial/ethnic group.

Suicidality. For the outcome of positive suicide screen, a binary logistic regression found Black/African American (OR = 2.31, CI = 1.04-5.13, $p < .05$), Asian American (OR = 1.83, CI = 1.13-2.97, $p < .05$), and Latinx (OR = 2.07, CI = 1.25-3.45, $p < .01$) students were significantly more likely to screen positive for suicide risk relative to NHW students (see Figure 4).

Prior Treatment Receipt. Differences also emerged for likelihood of prior self-reported mental health treatment or diagnosis receipt, such that Asian American (OR = 0.48, CI = 0.37-

0.62, $p < .001$), and Latinx (OR = .53, CI=0.40-0.70, $p < .001$) students were significantly less likely to report having received previous treatment or diagnosis, compared to NHW students, covarying for the effects of current depression and anxiety severity (Figure 5). Covariates of depression (OR = 1.02, CI=1.01-1.02, $p < .001$) and anxiety (OR = 1.02, CI=1.01-1.02, $p < .001$) were also statistically significant predictors in the model.

Racial/Ethnic Differences in Treatment Enrollment and Initiation

Percentages of penetration by levels of engagement in treatment (eligibility, enrollment and initial use) by race/ethnicity are presented in Table 2. Results indicated no statistically significant racial/ethnic or gender differences in initial use of treatment across tiers. The effect of treatment tier eligibility was significant, such that those who were eligible for Tier 3 were more likely to initiate use of treatment than those eligible for Tiers 1-2 (OR = 5.23, CI = 3.52-7.78 $p < .001$). The effect of anxiety severity was also significant, such that those with higher anxiety severity scores were more likely to initiate treatment across tiers (OR = 1.02, CI = 1.00-1.03, $p < .01$).

Two additional binary logistic regression models were specified to explore racial/ethnic differences in initial treatment use within each tier. Models were considered exploratory due to small sample sizes for initial use for Black and Multiracial students when subset by tier. For the model within Tiers 1-2, covariates of depression, anxiety, and gender were entered. Results indicated no statistically significant racial/ethnic differences or effects for gender or depression on initial use of Tier 1-2 treatment. The effect of anxiety was significant, such that those with increased anxiety were more likely to engage in initial use of Tier 1-2 treatment (OR = 1.02, CI = 1.01-1.04, $p < .01$). For the Tier 3 model, no significant racial/ethnic differences, or effects for

gender, anxiety or depression were found. were found. Table 3 shows model results, and Figure 6 displays rates of initial use by race/ethnicity and tier.

Results from an exploratory multinomial logistic regression model examining possible racial/ethnic differences at each step of the initial engagement process (i.e. eligibility vs. enrollment, enrollment vs. initial use) indicated that the relative risk of being eligible but not enrolling in treatment was significantly lower for Asian American students compared to NHW students (RRR = 0.67, CI=0.45-0.99), $p < .05$). In addition, the effect of anxiety was significant, such that the relative risk of being eligible for treatment but not enrolling was lower for those with higher levels of anxiety (RRR=0.97, CI=0.97-0.99), $p < .001$). The relative risk of being in the initial treatment category vs. being enrolled without initiating care, was significantly higher for students in Tier 3, compared to those in Tiers 1-2 (RRR = 6.41, CI=3.58-11.47, $p < .001$) (Table 4). There were no significant racial/ethnic differences in relative risk of initiating treatment vs. enrolling but not initiating.

Discussion

The current study provides preliminary evidence on racial/ethnic differences in mental health problems, enrollment and initial use of digital and in-person treatment among students who self-selected into a mental health screening and treatment study at a diverse, public four-year university serving a large proportion of students of color. First, the significant representation of students of color in our sample (73.3%) suggests online screening may be an effective tool for reaching students from historically underserved groups on campus. We also identified racial/ethnic variation in levels of depression, anxiety and suicidality among students screened. Latinx and Multiracial students were more likely fall into a more severe depression level relative to NHW students, Black/African American and Latinx students were more likely to

fall into a more severe anxiety level relative to NHW students, and Asian American, Black/African American and Latinx students were more likely to screen positive for suicide risk compared to NHW students. Although students of color were less likely to have received prior treatment, they were no less likely than NHW students to enroll and initiate treatment in this program. Findings suggested that eligible Asian American students were significantly more likely to enroll in treatment relative to eligible NHW students, and there were no racial/ethnic disparities between NHW students and racial/ethnic minority students in initial treatment use.

Overall, rates of mental health prevalence in this screening sample fell within the range of previous estimates. 30.6% of students screened fell within the moderate-severe range for depression, which is within the range of depression prevalence estimates in recent large-scale studies of college students (16.8% to 41.1%; Lipson et al., 2018; Duffy et al., 2019). In our sample, 46.2% of students had moderate to severe anxiety, which falls within the range identified in prior studies (17.1% to 63.3%; Lipson et al., 2018; Duffy et al., 2019). Moreover, 7.0% of our screening sample screened positive for suicide risk, comparable to other study prevalence rates for past year suicidal ideation among college students (Lipson et al., 2018). Importantly, because the students in our study represent a self-selected sample, these mental health problem and severity rates do not represent a direct comparison to study samples in which students are randomly selected and screened. Yet, our findings suggest significant need among students screened, with 81.1% of screened students eligible for some level of treatment, which aligns with findings of previous studies showing high levels of need (Lipson et al., 2018).

Our interrogation of racial/ethnic differences in mental health problems in the screened sample revealed that students from some ethnic minority groups were at elevated risk for experiencing more severe depression and anxiety and elevated suicide risk compared to NHW

students. These differences in mental health problems may point to the need for mental health service systems to reduce barriers to engaging ethnic minority students in care. However, this finding must be interpreted with caution, given study design limitations. Because students self-selected into screening, as opposed a universal screening, our findings may not reflect overall higher need among ethnic minority students on campus. An alternative explanation for the elevated severity observed among ethnic minority students screened may be that proportionally more ethnic minority students with mental health need opted to take the screener compared to NHW students. This interpretation may be less plausible given that the penetration of screening among students of color appeared higher than among NHW students, but it cannot be ruled out. We can conclude that among ethnic minority students who opted into mental health screening, there was a higher base rate of demonstrated need for care, as compared to NHW students.

In general, these findings align with prior evidence that found elevated mental health concerns among students of color (Lipson et al., 2018). Although the current study did not assess determinants of mental health outcomes that might explain elevated severity among college students of color, a multitude of social determinants of mental health disparities are well established. For example, experiencing discrimination and racial microaggressions on campus have been consistently associated with poorer mental health outcomes, including depression, anxiety and suicide risk, among students of color (Nadal et al., 2014; Hwang & Goto, 2008; Prelow, Mosher & Bowman, 2006). Perceived discrimination has also been associated with lower perceptions of social support, which in turn has been linked with depression among Black/African American college students (Prelow, Mosher & Bowman, 2006). Imposter feelings experienced by Asian American, Black/African American, and Latinx college students have been found to moderate and mediate links between perceived discrimination and depression and

anxiety symptoms (Cokley et al., 2017). Negative experiences of campus climate and lower feelings of belongingness have also been linked with poorer mental health outcomes among college students of color and first-generation college students (Stebbleton, Soria & Huesman, 2014; Arbona & Jimenez, 2014). Thus, several potential explanations for the elevated rates of mental health problems among college students of color observed in this screening study and in prior studies exist. Studies that continue to explore and identify social determinants of racial/disparities among college students represent a key direction for future research.

Our findings also suggested that Asian American and Latinx students screened were less likely than NHW students to have received previous mental health treatment, covarying for current depression and anxiety (Lipson et al., 2018; Liu et al., 2018). In our sample, 20.2% of Asian American and 22.6% of Latinx students reported that they have received prior treatment or a diagnosis, compared to 32.7% of NHW students. These findings are aligned with prior research that underscores enduring disparities in mental health service use on college campuses (Lipson et al., Liu et al., 2018). To mitigate these disparities, numerous strategies have been employed, such as community outreach, gatekeeper training and culturally tailored programs and messaging (Banks, 2020; Lipson et al., 2018; Boone et al., 2011). Digital mental health tools have also been widely considered as a viable format for narrowing gaps in care for college students (Lattie, Lipson & Eisenberg, 2019).

Although online screening and interventions have long been considered a promising strategy to reduce disparities, no studies to our knowledge have empirically supported this claim in college student populations. Our findings indicated students of color were no less likely than NHW students to enroll in or initiate treatment offered through STAND. This finding sits counter to the research on mental health service use at large, which consistently highlights that

students of color are less likely to receive mental health care compared to NHW students (Eisenberg et al., 2011; Herman et al., 2011). The current study results provide support for the utility of digital mental health tools to mitigate disparities in utilization of care. Thus, campus outreach and messaging about the important goal of reducing the burden of depression, in conjunction with online mental health screening, may be an effective avenue to reaching underserved students to engage them in mental health monitoring and pathways to care.

Although this study did not find racial/ethnic disparities in enrollment and initial engagement with treatment, key differences in rates of engagement among those allocated to web-based therapy and face-to-face treatment were apparent. Students who were eligible for face-to-face treatment were significantly more likely to initiate treatment than those eligible for online therapy. This finding may be explained by differences in severity. Exemplified by their screening into a higher tier, the elevated severity experienced by these students likely confers increased functional impairment and subjective distress that drive greater perceived need for treatment than those with mild and moderate symptoms. Further, those who screened into face-to-face treatment were contacted multiple times by a study team member to recruit them into the study and enroll them, as opposed to being provided with an online link which required students to scroll through multiple screens and attend a virtual or in-person orientation visit in order to enroll in online therapy. The greater investment in converting screening to enrollment through human contact, compounded with increased symptom severity and impairment, are likely factors influencing the higher rate of engagement observed for face-to-face therapy. In contrast, user burden associated with requirements to move through several webpages with discrete steps in order to initiate use of the online therapy in tiers 1 and 2 may have constrained rates of uptake. Indeed, usability of digital mental health tools has been found to be a key factor associated with

engagement (Ng et al., 2019), emphasizing the need for streamlined and user-friendly processes to enhance engagement in digital mental health innovations.

Just over 1 in 5 students who were eligible and offered free online therapy enrolled in treatment, and 8.7% initiated use of treatment. Few prior studies have reported data on uptake and usage, complicating the relative assessment of this success rate. In a systematic review of digital mental health interventions in college students, Lattie and colleagues found that only 8 of 81 studies reported data on uptake, and rates of enrollment in these 8 studies ranged from 1 to 37% (Lattie et al., 2019). Though the enrollment rate in the online therapy program found in the present study falls within this range, many observers would agree that these rates of enrollment and initial use are suboptimal, because the large majority of students who are eligible for and offered care do not enroll and initiate use. Given that offering free, online care already significantly reduces many barriers, including cost and inconvenience, attention to additional factors that influence program uptake is needed, and innovative strategies that improve their initial use must be implemented.

Even among students who opted to enroll in online therapy, fewer than half completed their first online therapy session. Other studies have similarly found low rates of program initiation among individuals who enroll in online intervention programs (Bedford et al., 2018; Areán et al., 2016). These results are contextualized by evidence noting a substantial gap between human intention and behavior (Webb & Sheeran, 2016). A myriad of factors have been found to influence engagement with digital tools, including factors related to the program user (e.g. perceived relevance, motivation, self-efficacy) characteristics of the program itself (e.g. design features, ease of use), and features of the context the program is implemented in (e.g. integration within service system, accessibility, cost), but the centrality of each of these variables

in relation to initial use of programs is not well understood (Perski et al., 2017). Nonetheless, it is likely that commonly observed barriers to digital therapy engagement were at play in the present study, including factors such as limited perceived usefulness and fit, technical issues, limitations with regard to personalization and customizability, concerns about privacy and confidentiality, limited integration of the program with user daily life (Borghouts et al., 2021). Digital therapy programs that explicitly target these engagement barriers can improve uptake and retention in care. Given the current study rates of uptake and the well-established literature on barriers to engagement, we have designed the STAND Digital Therapy, a modular program that draws upon existing evidence-based interventions to target a range of disorders. To target established barriers to engagement, this program utilizes measurement-based care to guide the selection and tailoring of personalized treatment packages that address specific mental health concerns reported by the individual. The program's personalized packages were designed to maximize engagement, user friendliness, and interactivity, with an emphasis on diversity and inclusion. Research directions that focus on improving uptake of digital mental health programs are also essential to expand the reach of these interventions to currently underserved students.

A number of limitations must be considered in the interpretation of study findings. As previously noted, though STAND offers screening to all UCLA students, it is likely that those who self-selected into taking the screener had elevated interest or concerns about their mental health, as the program was advertised as a mental health tracking, screening and treatment resource. Given significant variability in mental health problems observed across campuses, the results of this study should be interpreted bearing this knowledge in mind (Eisenberg, Hunt & Speer, 2013). Further, the sample of Black/African American, Multiracial and Other ethnic minority students in our sample was relatively small, limiting power to detect differences for

these groups. In particular, for models comparing initial treatment use for NHW vs. Black students, parity in treatment use cannot be assumed, given potential for insufficient power to detect effects due to the small number of Black/African American students who initiated treatment use across tiers. Furthermore, we recognize that within the broad categories of each racial/ethnic group in this study, there are many subgroups with cultural differences, distinct histories and migration patterns. Our findings do not delineate unique differences between these subgroups. Future studies should describe the subgroups within these monolithic racial/ethnic categories, in order to foster a deeper and more nuanced understanding of diverse student community needs.

In addition, although our study demonstrated that students of color were well represented in an online screening sample, we were not able to compare the representation of each racial/ethnic group in our sample to the overall student body demographics using inferential tests, because we did not attain data on international student status in our screening survey. Given that the university serves a significant proportion of international students, conclusions regarding penetration of our screening tool among these students cannot be drawn. International students represent a large and growing contingent of the U.S. college student population and increased attention to their mental health needs is warranted as a future research direction. This is particularly critical, because evidence to date suggests significant disparities in mental health concerns and help-seeking exist for international students. For example, data indicate that international students are at elevated risk for mental health problems such as depression and anxiety (Cheung, 2011, Wei et al., 2007, Han et al., 2012), but are less likely to utilize mental health services relative to their domestic student counterparts (Eisenberg, Golberstein & Gollust, 2007; Skromanis et al., 2018; Clough, Nazareth, Day & Casey, 2018). In addition, differences in

help-seeking between international and domestic students from the same racial/ethnic group are apparent. In a U.S. sample of Asian American and Asian international college students, international status was related to lower rates of help-seeking, and the association between perceived mental health stigma and personal stigma was stronger for Asian international students compared to Asian American domestic students (Maeshima & Parent, 2020). These findings emphasize the need to delineate differences in treatment and help-seeking between domestic and international students, including among those who share racial/ethnic identities, to enhance our understanding of needs and outreach strategies to diverse student groups.

Last, we do not have data on whether students who did not enroll in STAND treatment were receiving mental health services elsewhere. However, our data suggest that 3 of 4 students who were screened denied any prior history of mental health service receipt, indicating that many students with current needs likely remain underserved. While our study focused on documenting racial/ethnic differences in symptoms and engagement, we did not examine other important predictors of mental health, enrollment and engagement. Given the small number of studies on uptake of digital mental health programs, future research should focus on the unique predictors of online therapy enrollment among college students and identify strategies to promote initial engagement. Although our study did not find racial/ethnic disparities in treatment uptake, our sample was comprised primarily of students of color, highlighting that there continue to be a large proportion of ethnic minority students with mental health needs that remain unmet. Thus, efforts to improve engagement in DMHI should attend to factors that influence help-seeking and treatment receipt within these populations.

Notwithstanding these limitations, this study makes several novel contributions. With regard to enumeration of mental health problem severity, our study is unique in that it contains a

large sample of Asian American and Latinx students, who have been traditionally excluded, or included in small sample sizes, in the college mental health literature. While prior samples are comprised of primarily NHW students, ranging from 72-74% in recent largescale studies (Duffy et al., 2019), our sample identified primarily as students of color, with just 26.7% of students identifying as NHW. Furthermore, the extant literature largely describes differences in mental health prevalence across racial/ethnic groups, while the current study emphasizes differences in severity of common mental health concerns. From a resource allocation perspective, delineating levels of need of various racial/ethnic groups in various contexts is essential to informing design and implementation of student mental health care systems. Additionally, studies that collect data on intersecting identities within racial/ethnic minority samples (e.g. nationality, generation status, religion, gender identity, sexual orientation) and explore levels of mental health need within these subpopulations are needed to advance our knowledge about diverse student needs.

Most notably, our study provides preliminary support for the utility and effectiveness of online mental health tools in reducing disparities in screening and treatment engagement, even among students who have not had prior experiences with mental health services. Although many scholars have implicated the role of digital innovations in mitigating mental health disparities, few studies have empirically assessed the validity of this claim, and evidence within college student populations is especially lacking. The current study findings provide preliminary support for an innovative, comprehensive, online screening and treatment strategy to enhance equity in mental health care for students of color. Aligned with our findings that online screening and treatment have potential to enhance mental health equity among college students, the development and implementation of innovative strategies that enhance uptake and engagement in digital mental health tools represents an essential next step. Our study emphasizes that two

windows of time, between eligibility confirmation for treatment and enrollment, and between enrollment and initial use, represent key points of intervention for enhancing engagement.

Digital mental health tools hold clear promise for advancing mental health equity among college students, but in order to succeed in this task, we must focus our efforts on better understanding and enhancing student engagement with them.

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Tables

Table 1.
Descriptive Data on Race/Ethnicity and Gender in Screening Sample and Student Body

Demographic Variable	Screening Sample (n=2,090)	Full Student Body (n=45,930)
Race/Ethnicity		
Asian/Asian American	34.6%	24.9%
White	26.7%	28.6%
Latinx	23.2%	18.9%
Multiracial	08.5%	05.4%
Black/African American	04.4%	03.0%
Other	02.5%	03.0%
International Students	--	16.3%
Gender		
Female	72.7%	54.6%
Male	27.3%	45.4%

*Note. International vs. domestic, and graduate vs. undergraduate student status data were not collected in mental health screening survey.

Table 2. Descriptive Data on Eligibility, Enrollment and by Race/Ethnicity

		NHW n = 559	Black n = 92	Asian Am n = 723	Latinx n = 486	Multiracial n = 177	Total n = 2037
All Tiers	Eligible	441 (78.9%)	74 (80.4%)	574 (79.4%)	406 (83.5%)	158 (89.3%)	1653 (81.1%)
	Enrolled	105 (23.8%)	20 (27.0%)	163 (28.4%)	98 (24.3%)	39 (24.7%)	425 (25.7%)
	Initial Use	60 (13.6%)	8 (10.8%)	83 (14.5%)	54 (13.3%)	20 (12.7%)	225 (13.6%)
Tiers 1&2	Eligible	365 (65.3%)	52 (56.5%)	436 (60.3%)	322 (66.3%)	130 (73.4%)	1305 (64.1%)
	Enrolled	71 (19.4%)	13 (25.0%)	102 (23.4%)	67 (20.8%)	25 (19.2%)	278 (21.3%)
	Initial Use	33 (9.0%)	3 (5.8%)	37 (8.5%)	31 (9.6%)	9 (6.9%)	113 (8.6%)
Tier 3	Eligible	76 (13.6%)	22 (23.9%)	138 (19.1%)	84 (17.3%)	28 (15.8%)	348 (17.1%)
	Enrolled	34 (44.7%)	7 (31.8%)	61 (44.2%)	31 (36.9%)	14 (50.0%)	147 (42.2%)
	Initial Use	27 (35.5%)	5 (22.7%)	46 (33.3%)	23 (27.4%)	11 (39.3%)	112 (32.2%)

Note. Other ethnic minority race/ethnicity (n=42) excluded from engagement analyses due to n < 5 within initial use level of DV. Row percentages reflect the % of students who were eligible among those screened, % of students who enrolled among those who were eligible; % of those with initial use among those who were eligible.

Table 3. Binary Logistic Regression on Initial use of Treatment

Variable	Initial Use Combined Tiers		Initial Use Tiers 1-2		Initial Use Tier 3	
	OR (95% CI)	p value	OR (95% CI)	p value	OR (95% CI)	p value
Race/Ethnicity (NHW)						
Black/African American	0.56 (0.25-1.27)	0.163	0.57 (0.17-1.95)	0.370	0.53 (0.18-1.62)	0.268
Asian American	0.93 (0.64-1.35)	0.698	0.96 (0.59-1.58)	0.875	0.86 (0.48-1.56)	0.621
Latinx	0.86 (0.57-1.31)	0.487	1.04 (0.62-1.74)	0.894	0.63 (0.32-1.26)	0.193
Multiracial	0.92 (0.52-1.62)	0.762	0.77 (0.36-1.68)	0.518	1.15 (0.47-2.84)	0.748
Male (Female)	0.96 (0.69-1.35)	0.840	1.01 (0.64-1.59)	0.961	0.92 (0.56-1.61)	0.737
Tier 3 Eligibility (Tier 1-2)	5.23 (3.52-7.78)***	< .0001	--	--	--	--
Depression Severity	0.98 (0.97-1.00)	0.083	0.99 (0.97-1.01)	0.219	0.98 (0.96-1.01)	0.225
Anxiety Severity	1.02 (1.00-1.03)**	0.004	1.02 (1.01-1.04)**	0.005	1.01 (0.99-1.03)	0.237

Note. Reference group is parenthesized for categorical IVs.

*p < .05, ** p < .01, *** p < .001

Table 4. Multinomial Logistic Regression on Engagement in Treatment Outcome

Variable	<u>Relative Risk of Not Enrolling when Eligible</u>		<u>Relative Risk of Initiating Treatment when Enrolled</u>	
	(Eligible vs. Enrolled) RRR (95% CI)	p value	(Initial Use vs. Enrolled) RRR (95% CI)	p value
Race/Ethnicity (NHW)				
Black/African American	0.66 (0.32-1.35)	0.260	0.40 (0.15-1.08)	0.071
Asian American	0.67 (0.45-0.99)*	0.049	0.66 (0.40-1.10)	0.109
Latinx	0.99 (0.63-1.55)	0.967	0.86 (0.48-1.51)	0.591
Multiracial	0.83 (0.46-1.48)	0.530	0.78 (0.37-1.66)	0.519
Male (Female)	0.89 (0.63-1.26)	0.526	0.87 (0.56-1.37)	0.572
Tier 3 Eligibility (Tier 1-2)	1.26 (0.77-2.07)	0.347	6.41 (3.58-11.47)***	< 0.001
Depression Severity	1.00 (.98-1.02)	0.743	0.99 (0.97-1.01)	0.288
Anxiety Severity	0.97 (0.97-0.99)***	< 0.001	1.00 (0.98-1.01)	0.590

Note. Reference group is parenthesized for categorical IVs. The base outcome of enrolled but did not initiate use (1) was compared to the outcomes of eligible but did not enroll (0) and enrolled and initial use (2).

*p < .05, ** p < .01, *** p < .001

Figures

Figure 1. Consort Flow from Screening to Initial Use for Study Sample

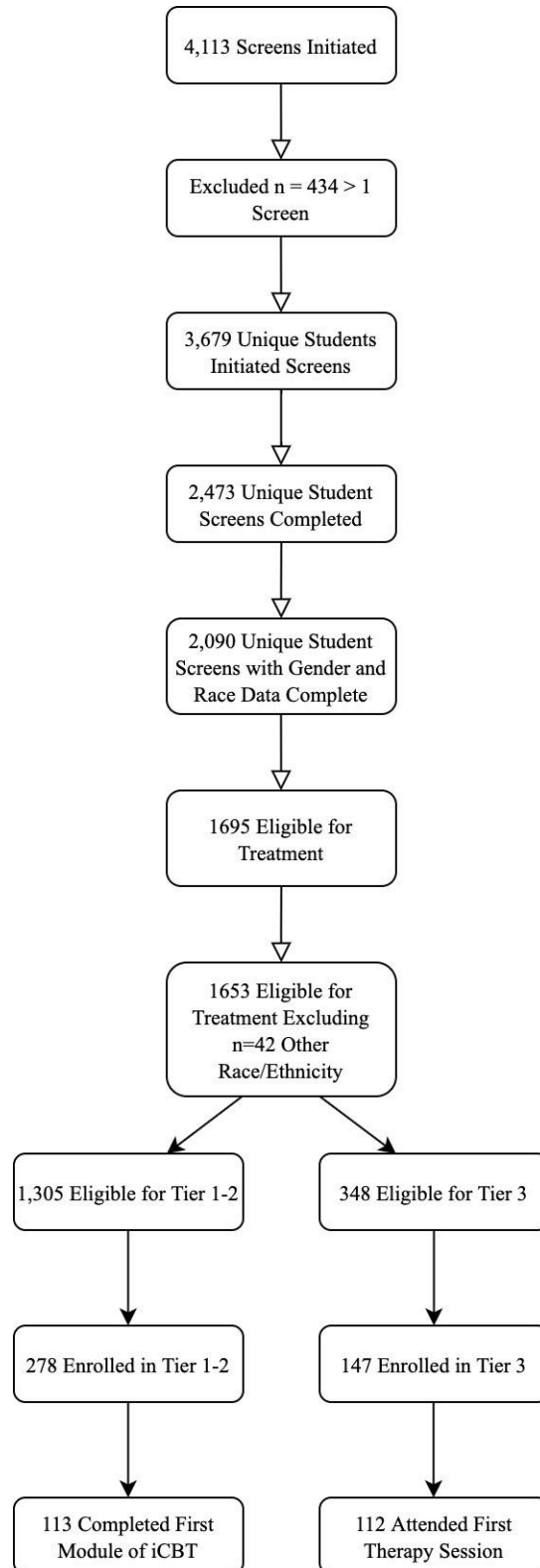
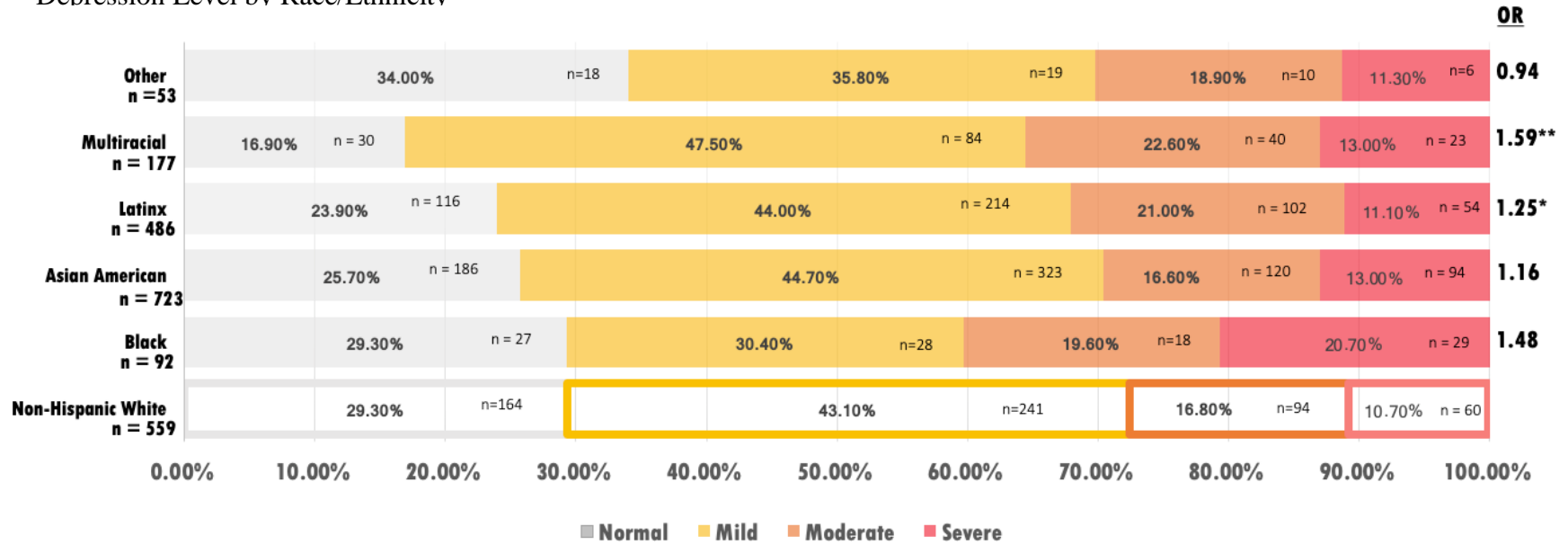
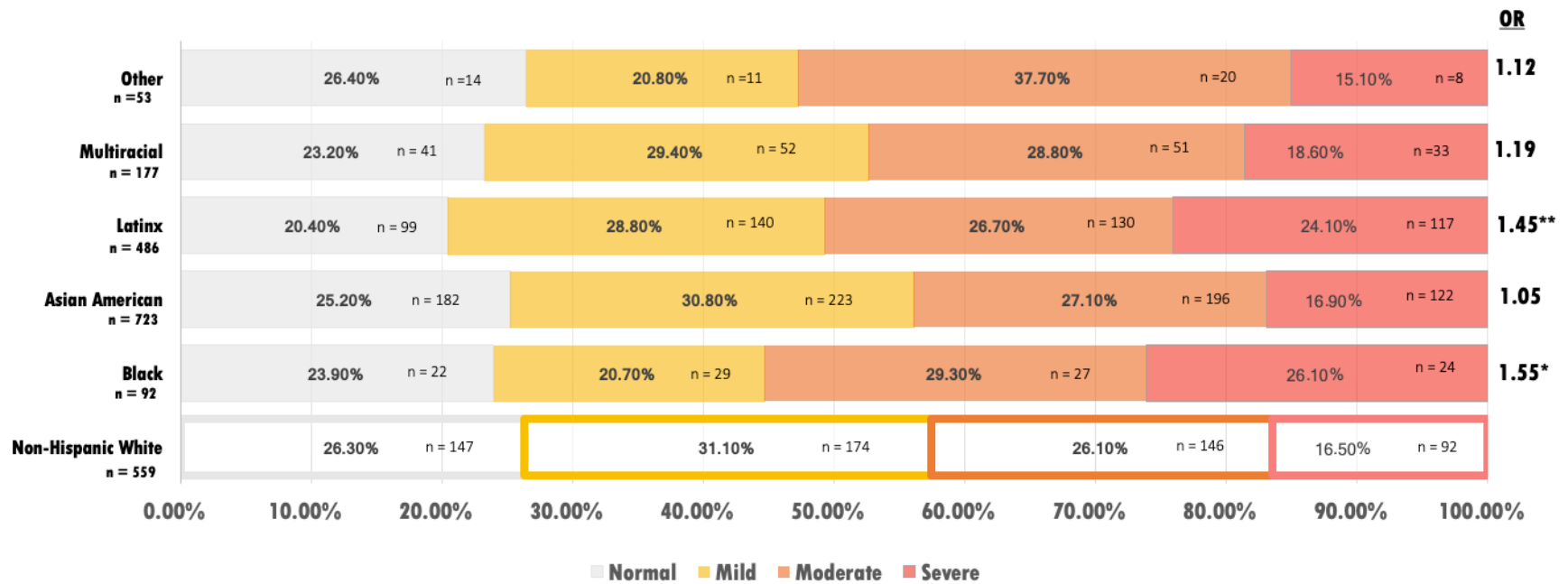


Figure 2.
Depression Level by Race/Ethnicity



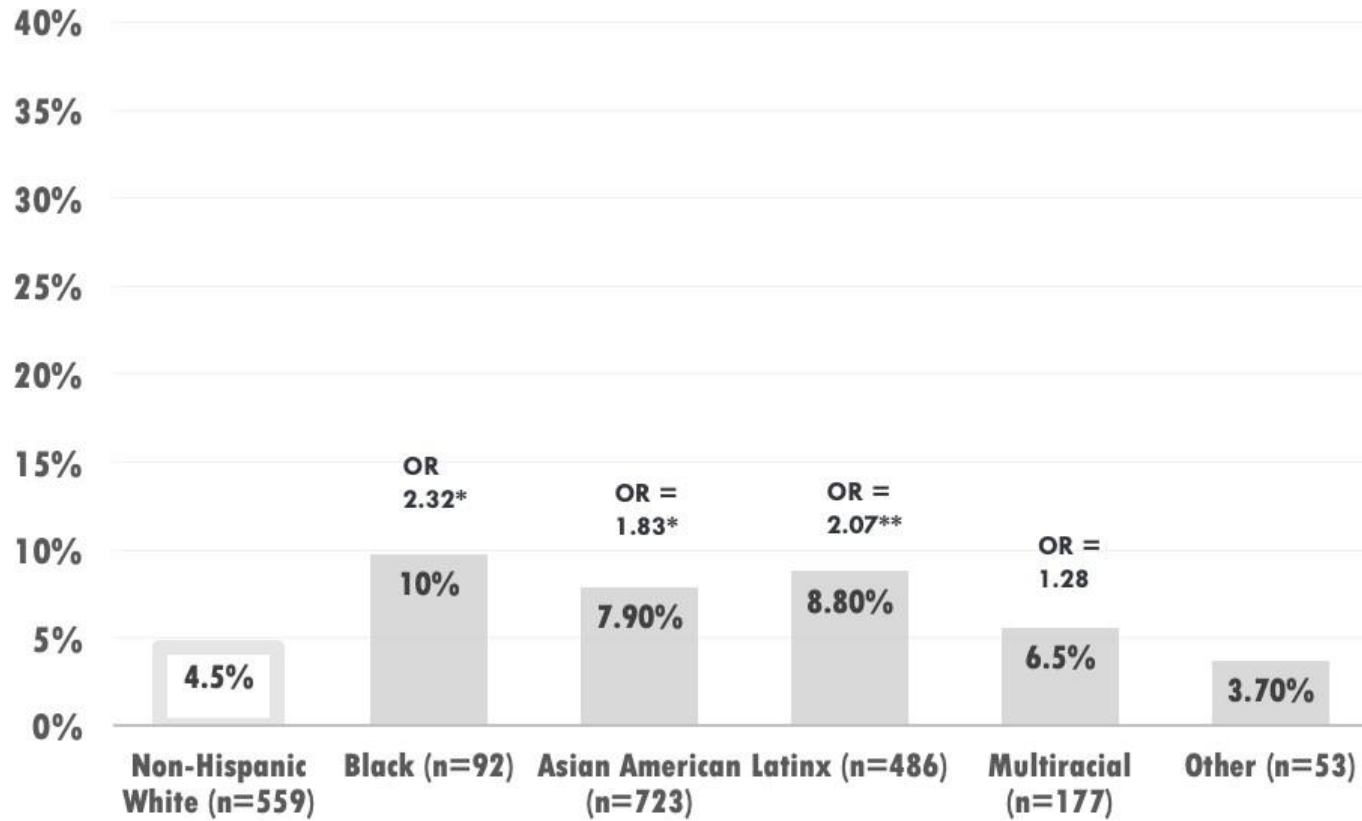
Note. Odds ratios (OR) are derived from ordinal logistic regression models comparing each ethnic minority group to NHW (reference group) on CAT-DI depression outcome. *p < .05, **p < .01

Figure 3.
Anxiety Level by Race/Ethnicity



Note. Odds ratios (OR) are derived from ordinal logistic regression models comparing each ethnic minority group to NHW (reference group) on CAT-ANX anxiety outcome. *p < .05, **p < .01

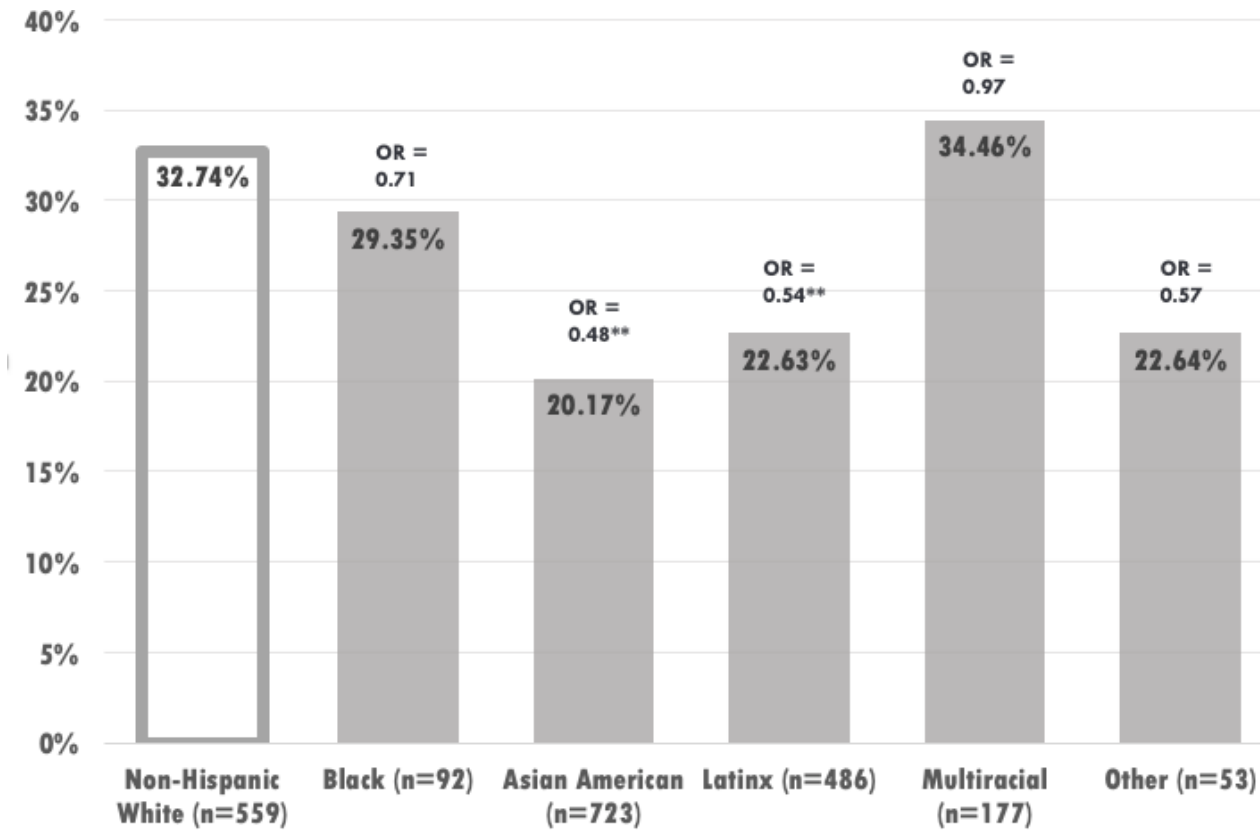
Figure 4.
Positive Suicide Screen by Race/Ethnicity



Note. Odds ratios (OR) represent contrasts from binary logistic regression model comparing each racial/ethnic minority group to NHW. Other race/ethnicity excluded from logistic regression model due to small n=2.

* $p < .05$, ** $p < .01$.

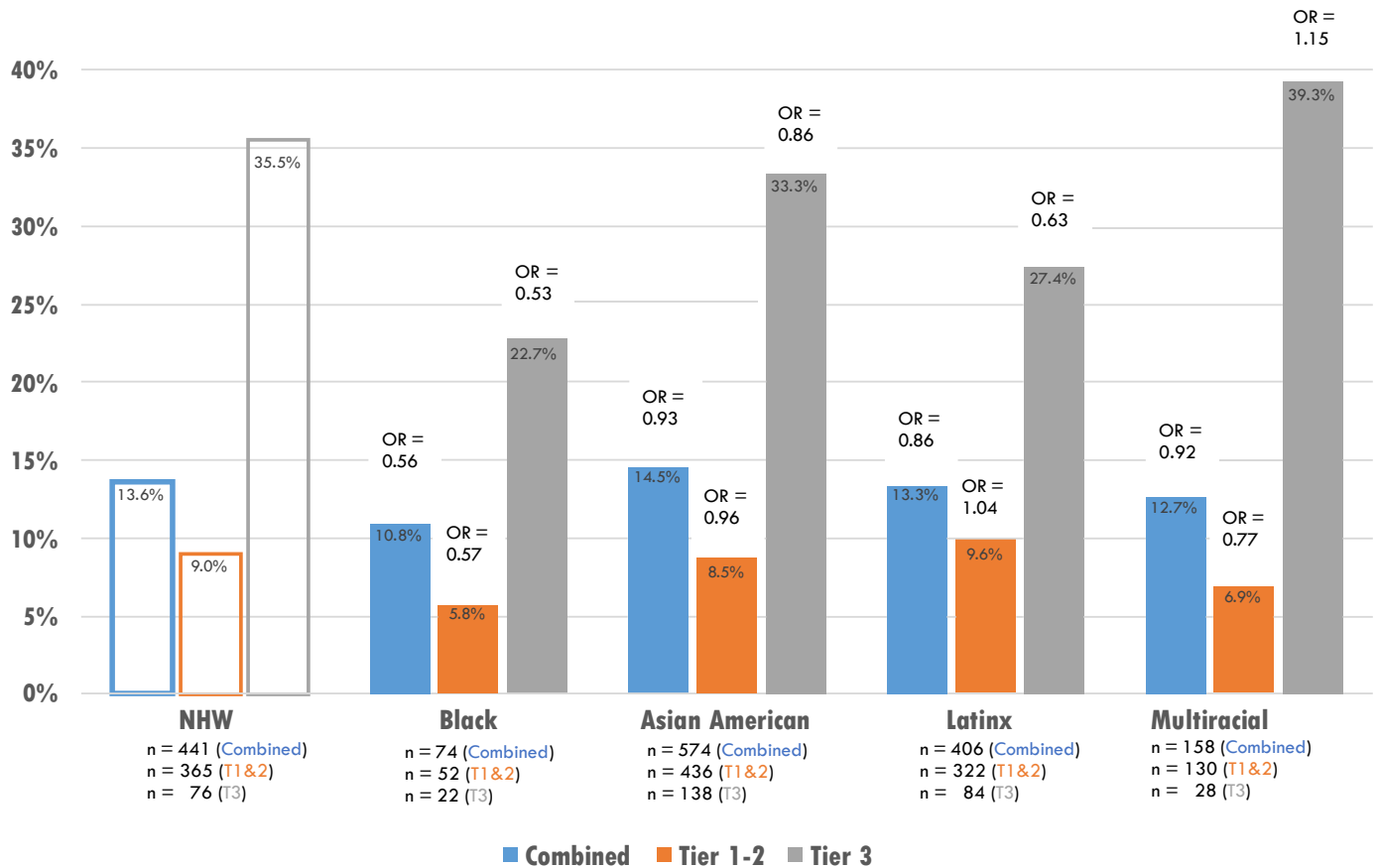
Figure 5.
 Prior Mental Health Treatment or Diagnosis Receipt by Race/Ethnicity



Note. Odds ratios (OR) represent contrasts from binary logistic regression model comparing each racial/ethnic minority group to NHW. Covariates of current depression and anxiety were also entered into the model.

* $p < .05$, ** $p < .01$.

Figure 6. Initial Use of Treatment by Race/Ethnicity



Note. n’s reflect eligible participants within each racial/ethnic subgroup across tiers (combined), Tier 1-2 and Tier 3. Odds ratios (OR) represent contrasts from each binary logistic regression model comparing each racial/ethnic minority group to NHW on the dichotomous outcome of initial treatment.

For the model on the initial treatment DV combined for all tiers, covariates included: gender, treatment tier eligibility, depression, anxiety.

For the model on the initial treatment DV within Tiers 1-2, covariates included: gender, depression, anxiety.

For the model on the initial treatment DV within Tier 3, covariates included: gender, depression, anxiety.

**Study 2: Barriers and Strategies to Improve Digital Mental Health Intervention Uptake
among College Students of Color: A Modified Delphi Study**

Abstract

Purpose. Digital mental health interventions (DMHI) have the potential to enhance equity in college student mental health, but engagement with them is poor. Little is known about barriers and strategies to enhance DMHI uptake among college students of color. The goal of the current study was to attain expert consensus on important barriers to DMHI uptake and important and feasible engagement strategies to enhance DMHI uptake among college students of color.

Methods. The study utilized a modified, three-round Delphi survey. Scientist and industry stakeholders with relevant expertise participated (n=35). Across rounds, experts generated and rated the importance and feasibility of barriers and strategies to promote DMHI uptake for students of color. Experts viewed group consensus and importance ratings between rounds and were provided the opportunity to re-rate items. Barriers and strategies were coded into categorical frameworks using rapid qualitative analysis and grounded theory.

Results. Across rounds a total of n=63 barriers and n=64 strategies were derived, and agreement on level of importance was met for 98% of barriers and strategies. A go-zone plot revealed a key subset of strategies (n=25) high on importance and feasibility based on final round ratings. Strategies spanned multiple levels of implementation and emphasized codesign, diverse representation, reducing user burden, addressing privacy issues, and embedding DMHI within existing infrastructure.

Conclusions. This study identified a set of multilevel barriers and strategies for improving DMHI uptake for college students of color. The subset of highly feasible and important engagement strategies derived in this study provides direction for the design of scalable engagement interventions with the potential to improve DMHI implementation and reduce disparities in care receipt.

Introduction

College students of color have higher levels of unmet mental health need compared to their white counterparts (Lipson et al., 2019; Miranda et al., 2015; Herman et al., 2011). A constellation of barriers fuels these inequities, including exposure to racism and microaggressions on campus, lack of culturally responsive care, insufficient time to seek services, beliefs that treatment is not needed, and limited knowledge of mental health resources (Miranda et al., 2015; Banks et al., 2020; Lipson et al., 2018). Among students who identify a need for treatment, many describe difficulties with access and inconvenience, and report skepticism about quality and efficacy of care (Eisenberg et al., 2011). Further, students of color often report less knowledge of campus mental health resources, and stigma regarding mental health service seeking is high for all college students, but especially among students of color relative to their white peers (Miranda et al., 2015; Lipson et al., 2018). Students of color also report lower levels of prior engagement with mental health services, a known predictor of future treatment use (Miranda et al., 2015; Vidourek et al., 2014; Kodish et al., 2021; Borghouts et al., 2021). These barriers are compounded by system-level constraints to delivering equitable care to college students, such as severe shortages of mental health providers, long counseling center wait times, curtailment of counseling center services (e.g., imposing a maximum number of sessions or decreasing session frequency), and insurance requirements (Cornish et al., 2017; LeViness et al., 2018; Gallagher, 2014).

To address these barriers, improve access, and enhance equity in mental health care, digital mental health interventions (DMHI) have emerged as a viable and scalable mode of treatment delivery (Lattie et al., 2019; Fitzsimmons-Craft et al., 2021). DMHI are an especially promising avenue for reaching college students, many of whom report insufficient time and

perceived inconvenience associated with face-to-face care, and express comfort with and acceptance of technology (Healthy Minds Study, 2019; Lattie, Lipson & Eisenberg, 2019). Additionally, some data indicate that students of color may prefer to access services online as opposed to face-to-face, underscoring the potential for digital technologies to improve equity in access to college student mental health supports (Lungu & Sun, 2016; Dunbar et al., 2018). DMHI have been often been proposed as a solution to bridging gaps in care for underserved populations globally (Schueller, Hunter, Figueroa, & Aguilera, 2019), but increased responsiveness to the priorities and needs of marginalized communities is needed for DMHI to succeed in this task (Kozelka et al., 2021).

Many DMHI have been tested and found to be effective in reducing depression, anxiety, and stress in college students (Davies, Morriss & Glazebrook, 2014; Lattie et al., 2019). In a systematic review of 89 DMHI trials with college student populations, results indicated the majority of DMHI were effective (47%) or partially effective (34%) in improving mental health outcomes (e.g., depression, anxiety, stress, well-being). Interventions were primarily delivered via web-based platforms (80%), while a smaller number were delivered via mobile phones. Most DMHI included in this review were developed specifically for research studies (83.1%), but some also utilized commercially available interventions. The majority of DMHI were cognitive-behavioral interventions, the modal intervention length was 8 weeks, and over one-third involved human support elements, an intervention component that has been consistently linked with improved DMHI effectiveness and engagement (Lattie et al., 2019; Schueller, Tomasino & Mohr, 2017).

Although DMHI have been shown to be effective in college student populations, many students in need do not receive them. Universal campus online screening may offer an

opportunity to overcome gaps in identification of student need and target the dissemination of DMHI to reduce service use disparities. For example, students of color who completed an online mental health screener and were identified to have mild-severe anxiety and mild-moderate depression were no less likely than their white peers to enroll in and initiate a free DMHI (Kodish et al., 2021). However, among students who were offered this DMHI, only 21.3% enrolled and 8.6% used the program even once, suggesting that identifying need and providing access alone do not lead to engagement. These findings align with previously identified suboptimal rates of uptake of DMHI among college students (Lattie et al., 2019). While few studies of college student targeted DMHI implementation efforts report data on uptake and adoption outcomes, Lattie and colleagues in their 2019 systematic review found that rates of enrollment ranged from 1-37%, which is firmly in line with the previous findings and emphasizes significant need for improvement (Lattie et al., 2019).

The COVID-19 pandemic may have exacerbated already poor rates of uptake in digital mental health among college students. A recent study examined uptake of the IntelliCare for College Students Program, which was implemented on two campuses serving approximately 50,000 students, and results found that a mere 0.02% (117) of students downloaded and registered the DMHI (Lattie et al., 2021). This miniscule rate of use stands in contrast to mounting evidence of increased prevalence and severity of mental health problems among college students during the pandemic, a period marked by chronic stress, isolation, and loss (Charles et al., 2021; Lee et al., 2021). Research has also found that students from marginalized groups (e.g., women, non-binary and Latinx students) had higher levels of internalizing mental health problems during the early stages of the pandemic, relative to students from more privileged backgrounds (e.g. male, white) (Lin et al., 2021). These data emphasize that targeted

strategies to enhance user uptake of DMHI are needed to bridge current gaps in care access for marginalized college students.

Barriers and Facilitators to DMHI Engagement. Several explanations for poor engagement with digital interventions exist, including perceptions that these programs are not-user friendly, do not protect privacy, and are not seen as trustworthy (Torous et al., 2018). Qualitative interviews with participants in a multi-site pragmatic trial testing two prominent DMHI revealed numerous engagement barriers, including ambivalence or negative perceptions about the method of online care delivery, dissatisfaction with program presentation style and content, and the absence of structure and personalized psychological support (Knowles et al., 2015). Extending the reach and impact of DMHI requires increased attention to implementation and intervention factors associated with DMHI engagement among intended end-users (Mohr et al., 2017; Hermes et al., 2019; Schueller & Torous, 2020).

In a recent systematic review, barriers and facilitators to DMHI engagement in general populations were further identified and categorized (Borghouts et al., 2021). Constructs associated with DMHI engagement included user-related factors (e.g. personal beliefs, skills and experiences), program-related factors (e.g. type of content, perceived fit and perceived usefulness), and technology and environment related factors (e.g. privacy and confidentiality, social influence, implementation considerations) (Borghouts et al., 2021). For example, positive beliefs about mental health help-seeking, digital health literacy, and integration of DMHI into daily life were user-level factors associated with increased engagement. Credible content, appropriate length of content, personalization of information and interventions, and guided elements (e.g., human therapist, automated reminders) were program-related factors linked with better engagement outcomes. Technical issues and concerns about privacy and anonymity were

identified as barriers to engagement. Implementation factors associated with enhanced engagement included providing users with training to how to use the DMHI (Borghouts et al., 2021). These findings underscore that barriers to DMHI engagement must be considered at multiple levels. In addition, delineating the unique characteristics of target user groups, and developing responsive interventions to promote engagement, is a high priority area for DMHI research and implementation efforts.

While research has identified constructs related to DMHI engagement in general populations, less is known about specific considerations for students of color, and no known studies have focused on barriers most proximal to the uptake/initial use stage of engagement. Yet, data from the broader digital intervention literature indicate that factors associated with initial use may differ from those related to sustained use. For instance, one's motivation to visit an online intervention and perceptions of the intervention as personally relevant were identified as key factors associated with an initial visit to an online intervention, while factors associated with the intervention itself (e.g., provision of regular new content, opportunities to monitor personalized progress) were more proximally related to revisiting an intervention (Brouwer et al., 2008).

Despite data suggesting suboptimal rates of DMHI uptake and indication that factors associated with initial vs. sustained use may differ, most studies on DMHI engagement have examined factors associated with drop out and retention once users are already enrolled in DMHI (Torous et al., 2020). This is likely due to a large body of findings illustrating poor rates of sustained engagement following initial download or use of DMHI (Baumel & Kane, 2018; Baumel et al., 2019; Kaveladze et al., 2022). However, evidence also highlights poor rates of uptake, especially in college student populations (Lattie et al., 2022), but research characterizing

the unique barriers to DMHI uptake (also frequently characterized as “adoption” or “initial use”) is currently lacking. Studies that delineate these barriers faced by college students of color can specify our understanding of this fundamental stage of DMHI engagement in this population.

Strategies to Promote DMHI Engagement. Strategies to promote engagement in DMHI have been developed and tested, but the vast majority focus on retention of users once they are already enrolled in programs. Effective strategies for increasing retention once individuals are enrolled in DMHI include sending electronic prompts, providing personalized feedback, providing coaching or paraprofessional support, delivering weekly recommendations, and leveraging motivational interviewing techniques within the intervention content (Alkhalidi et al., 2016; Mohr et al, 2019; Titov et al., 2010). Less is known about strategies to enhance initial use of DMHI, and no known studies have focused on strategies to promote uptake among college students, or students of color, in particular. Enhancing initial uptake of DMHI within this population is essential, because less than half of college students with mental health need utilize in-person services, and rates of treatment engagement among students of color are even lower (Lipson et al., 2018). Furthermore, although DMHI are effective and engagement strategies to enhance adherence once users are enrolled are readily available, students cannot begin to benefit from these interventions and retention strategies if they do not initiate use of these programs.

Efforts to enhance engagement to date have also largely focused on tailoring of DMHI program features (Torous et al., 2018). However, user, environmental, and implementation factors have been established as key constructs related to DMHI engagement (Borghouts et al., 2021). In a sample of community college students, the majority of whom identified as racial/ethnic minorities, results suggested that social environment was a key determinant of mental health app use. The more individuals perceived that other people in their social sphere

thought they should use mental health apps, the more likely they were to use them (Borghouts et al., 2021). Aligned with these findings, scholars have urged for consideration of context-level factors from the earliest stages of digital intervention development and implementation (Hermes et al., 2019; Fleming et al., 2018). Feasibility is considered a key predictor of intervention adoption and sustainment in the broader implementation science literature (Lyon & Burns, 2019), and is highly pertinent to DMHI implementation as well (Hermes et al., 2019). While extensive research has attended to feasibility of DMHI delivery (Edbrooke et al., 2019; Carpenter-Song et al., 2022), little research has examined the feasibility of DMHI engagement strategies. Examining both the importance and feasibility of strategies to enhance DMHI uptake among students of color can inform the development of a critical subset of optimal strategies with the greatest potential for impact.

Given limited data on uptake of DMHI among college students of color, scientists and industry professionals with relevant expertise represent a relatively untapped source of data for understanding barriers to DMHI uptake and strategies to improve uptake. In particular, scientists who study DMHI likely have expertise related to DMHI uptake and can speak to strategies they have employed to recruit and engage students, but these techniques are rarely described in the published literature. Industry stakeholders represent a group with significant implementation expertise whose insights are also rarely included in the scientific base. Generating expert consensus using Delphi survey methods is recognized as an acceptable, systematic, and empirical approach to collect data on topics for which the published literature is limited (Iqbal & Pison-Young, 2009; Turoff & Linstone, 2002; Dalkey, 1969). Delphi studies have previously been used to gather expert consensus on factors associated with use of online behavioral change interventions and implementation strategies (Brouwer et al., 2008; Powell et al., 2015).

Study Aims. In response to fundamental gaps in knowledge about promoting DMHI uptake for college students of color, the aim of the present study was to attain expert consensus on (1) important barriers to DMHI uptake and (2) important and feasible engagement strategies to enhance DMHI uptake among college students of color, using a modified Delphi design. We also sought develop a preliminary conceptual framework for categorizing strategies to improve DMHI uptake for college students of color. The pragmatic objectives of the research were to clarify prominent barriers to DMHI uptake for college students of color and identify a foundational set of engagement strategies that can be co-designed in collaboration with student stakeholders, with the goal of improving DMHI reach among underserved students.

Method

Overview of Delphi Approach. This study used a modified online Delphi survey design to attain DMHI expert consensus on (1) important barriers to DMHI uptake and (2) important and feasible strategies to enhance uptake of DMHI for students of color. The goal of a traditional Delphi study is to attain consensus from a group of experts about a specific issue or question (Iqbal & Pison-Young, 2009). Delphi methods are anonymous, providing respondents the opportunity to express their perspectives free of social or majority pressures or judgments. They are iterative, occurring over the course of multiple rounds in which participants can opt to adjust their responses based on knowledge of the group consensus. The facilitator delivers controlled feedback about the group judgment to participants between rounds, and aggregates responses to determine final group convergence (Rowe & Wright, 2001). Delphi guidelines also suggest that the quality of input provided by experts is highly influenced by the quality of input given to them (Jorm, 2015). For this reason, we used a modified Delphi design, integrating both structured and open-ended questions to prompt expert generation of barriers and strategies.

This modified Delphi study consisted of three rounds, as recommended by best practice guidelines (Trevelyan & Robinson, 2015). Participants were compensated a maximum of \$100 in gift card form across rounds (\$50 for completing Round 1, \$25 for Round 2, \$25 for Round 3). Guidelines recommending sample sizes between 10 to 50 expert panelists were followed (Turoff, 2002), with evidence suggesting that studies with smaller panels have significantly higher response rates (Gargon et al., 2019). Determination of expert panelist eligibility varies across studies and is determined by study focus (Iqbal & Pison-Young, 2009). However, inclusion of a heterogeneous sample to reduce bias and maximize expertise, and development of clear inclusion criteria are recommended (Linstone & Turoff, 2002). The current study survey instrument was developed in collaboration with topic experts (members of this dissertation committee AL, SS, EGG) and included multiple stages of pilot testing and feedback integration. The first author of this paper developed an initial survey draft. Undergraduate research assistants first piloted the survey and provided feedback on language, clarity, and flow. Following this round of feedback integration, the three topic experts completed the survey and provided structured feedback. Feedback was integrated and the survey was recirculated to the same three experts, who reviewed and approved the survey prior to launch. This study was conducted online using Qualtrics survey software. Details about participant inclusion criteria, recruitment, and procedures, and data analyses are summarized in detail below for each round of the survey. The Institutional Review Board (IRB) reviewed the study protocol and determined that the study was exempt.

Participants

Study participants included experts drawn from four expert groups: (1) researchers with expertise in DMHI with racial/ethnic minority populations; (2) researchers with expertise in

DMHI in college student populations; (3) researchers with expertise in racial/ethnic minority mental health in college students; (4) DMHI industry professionals. Inclusion criteria for expert respondents from each of these groups is detailed below.

Group 1 experts (DMHI in racial/ethnic minority populations) were drawn from a narrative literature review on DMHI for marginalized populations (Schueller et al., 2019). The reference list was extracted from this paper, and experts eligible for this study included: (1) first and senior authors, (2) on papers on evaluating DMHI in racial/ethnic minority populations in the U.S., (3) with more than 1 publication on a related topic (DMHI, racial/ethnic minority mental health).

Group 2 experts (DMHI in college students) were drawn from a systematic review on DMHI for college student populations (Lattie et al., 2019). Similar to Group 1, this paper's reference list was extracted, and eligible experts included: (1) first and senior authors, (2) on papers describing results from pilot, randomized control or feasibility trials of DMHI, measuring depression/anxiety outcomes, with undergraduate student populations in the U.S., (3) with more than 1 publication on a relevant topic (DMHI among college students).

Group 3 experts (racial/ethnic minority mental health in college students) were drawn by reviewing the list of editorial board members for the Journal of Counseling Psychology, a journal with a strong focus on multicultural issues pertinent to counseling psychology, often involving college student populations. From this list, individuals (1) affiliated with U.S. academic institutions, (2) with more than one publication on mental health in college students of color were identified as potential respondents. Prospective participants from Groups 1-3 were invited to participate via email with study information and a Qualtrics link embedded.

Lastly, Group 4 respondents (industry experts) were identified using multi-stage approach. First, we conducted a systematic review of all U.S. public university and colleges (n=686), (1) student counseling center websites, and (2) student health center websites. Public colleges and universities were selected as criteria for this search because they tend to serve more diverse student populations. From these websites, we extracted the names of DMHI that were listed as being integrated within student health or counseling center care structures. This resulted in identification of ten DMHI (Therapy Assistance Online; YOU at College; WellTrack, Learn to Live; PsychHub; my Strength, Mindshift CBT; Sanvello, Silver Cloud; Talk Life, Talk Campus). From each of these DMHI webpages, names and contacts for individuals in the following industry positions and related roles were extracted: client engagement, client success, director/VP of campus programming, director/VP of campus partnerships, director of marketing, director of communications, chief science officer, chief product officer, and chief executive officer. Outreach included an initial email with a request to forward the recruitment email to individuals within each company with pertinent expertise in user engagement. Recruitment of industry professionals was supported by a DMHI topic expert (SS). A total of five of the ten identified DMHI companies were represented by respondents in Round 1.

Across all four groups, a total n=139 individuals were identified as experts. From this pool, 25%, (n=35) completed the Round 1 survey. Participant response rates for each group across rounds are depicted in Table 1. All n=35 participants who completed Round 1 were eligible for Round 2, and all of those who completed Round 2 (n=28) were eligible for Round 3. Outreach was conducted via email for each round, and was comprised of multiple email reminders to enhance retention across rounds.

Round 1

Measure. Participants were provided with a personalized Qualtrics online link to complete the Round 1 survey, comprised of three main sections. (1) Demographics: Questions assessed respondent age, gender, race/ethnicity, and areas of expertise. On the next set of screens, participants were oriented to the survey through a set of slides describing current gaps in the literature, and goals for the study. (2) Barriers: Participants were shown previously identified reasons for using and not using mental health apps, drawn from the Healthy Minds Survey (Healthy Minds Study, 2019). Next, they were shown a list of 19 previously identified barriers to DMHI engagement (drawn from the Healthy Minds Survey and augmented by literature on barriers to mental health services for college students of color). They were asked to rate each barrier for its importance as a determinant of DMHI uptake among college students of color using a 5-point Likert scale (0= not at all important, 1 = slightly important, 2 = moderately important, 3 = very important, 4 = extremely important). Respondents were also prompted to generate any additional barriers thought to influence DMHI uptake among college students of color based on their expertise. They were also offered the option to identify if specific barriers they rated as moderately-extremely important were pertinent to specific racial/ethnic minority student groups (Black/African American, Latinx/Hispanic, American Indian/Alaska Native, Asian/Asian American, Native Hawaiian/Pacific Islander, Middle Eastern/North African, International Students). (3) Engagement Strategies: Next, participants were provided with background information about engagement strategies developed for digital interventions broadly and briefed on current gaps in the literature (i.e., limited knowledge about uptake stage specifically, limited attention to college student of color populations, limited focus on digital innovations that target mental health concerns). A list of general digital intervention engagement strategies was drawn from the literature (Brouwer et al., 2008) and provided to respondents.

Respondents were instructed that they could use and adapt strategies from this list and/or generate novel strategies based on their expertise. They were provided the option to specify if their generated strategies were particularly pertinent for a specific racial/ethnic group (as noted above). To guide the generation of strategies, respondents were shown the barriers they rated as important and encouraged to nominate strategies that addressed these barriers.

Analyses. After Round 1, pre-populated barriers (n=19) and generated barriers (n=69) were extracted, and similar responses were combined and synthesized to minimize repetition and achieve data reduction. The new set of barriers (n= 56) were then categorized using a deductive rapid qualitative analysis approach, applying an existing conceptual framework for constructs influencing DMHI engagement (Borghouts et al., 2021; Hamilton et al., 2013). This framework was derived from a systematic review on DMHI engagement and comprised three overarching categories with subcategories listed under each: (1) user-related constructs (subcategories: beliefs, mental health experiences and skills, technology experience and skills, integration into user's life), (2) program-related constructs (subcategories: perceived fit, perceived usefulness, social connectedness, impact of the intervention), (3) technology and environment related constructs (subcategories: technology related issues, privacy/confidentiality, social influence and implementation) (Borghouts et al., 2021). Using this framework, a team of five coders characterized each barrier from Round 1 within each of the construct subcategories listed above. Coders met to compare categorization and resolve discrepancies (See Figure 1 for visual representation of coding scheme).

Given the paucity of existing frameworks categorizing DMHI engagement strategies, the strategies generated in this study were coded using an inductive, grounded theory approach (Glaser & Straus, 1967; Henwood & Pidgeon, 2003). The goal of grounded theory is to develop

an inductively-driven conceptual model for categorizing constructs and processes, making it an ideal method for classifying strategies in this study due to the dearth of previous literature on this topic. The list of strategies generated in Round 1 was extracted (n=512 across all respondents), and similar strategies were consolidated to remove duplicates and reduce repetition, leading to a total of n=54 strategies. Next, a team of five coders reviewed this list independently and developed data-driven coding taxonomies. Coders met to discuss, converge taxonomies, and finalize a coding framework. Coders then independently sorted each strategy into the coding framework, and met to determine consensus on sorting. The final coding framework organized strategies into four key levels of implementation (1) design of the DMHI itself, (2) onboarding/orientation to the DMHI, (3) marketing/outreach about the DMHI, (4) broader campus/community efforts to promote the DMHI (See Figure 2 for visual representation of coding scheme).

Aligned with standards for analyzing consensus for Delphi survey data, median scores were calculated to examine agreement on the importance of each barrier provided to respondents in Round 1. Median scores in the very to extremely important range (3 or 4) were considered to meet threshold for agreement on importance. Interquartile range (IQR) values were calculated to describe consensus on level of importance (Trevelyan & Robinson, 2015; Brouwer et al., 2005; Crutzen et al., 2008; Doughty 2009). A smaller interquartile range represented higher consensus while a larger range represented lower consensus. In this study, items with IQR values ≤ 1 were considered to have met criteria for consensus on importance level. Median and IQR values for barriers rated in Round 1 were presented to respondents in Round 2, in which they were provided the opportunity to re-rate each barrier with knowledge of the group opinion.

Round 2

Measure. In the survey, respondents were oriented to the goals of Round 2, including: (1) view expert consensus on barriers that were pre-populated and rated in Round 1, with an opportunity to rerate these barriers (2) rate new barriers generated by experts in Round 1, (3) rate engagement strategies generated by experts in Round 1. The survey was comprised of two main sections. (1) Barriers: Barriers were characterized and introduced within the categories drawn from the Borghouts et al. (2021) systematic review. For the barriers that were pre-populated for respondents in Round 1, participants were oriented to this study definition of consensus on importance (median rating of very-extremely important with $IQR \leq 1$) and were shown the median ratings and IQR values for each item from Round 1. Participants were provided the opportunity to re-rate these barriers after viewing the group's median rating and IQR. Barriers generated during Round 1 were rated for the first time by respondents in Round 2 on the same 5-point Likert scale for importance. (2) Strategies: Next, experts were presented with the organizing framework derived to classify strategies from Round 1. Experts were asked to rate these strategies, presented within the four-level framework, for the first time on the same 5-point Likert-scale for importance in enhancing uptake of DMHI among college students of color. Experts were also provided with the opportunity to write in any additional barriers or strategies.

Analyses. After Round 2, median and IQR values were calculated for all Round 2 barriers and strategies. In addition, new barriers and strategies written in during Round 2 were reduced, categorized, and included in the Round 3 survey instrument (n=7 new barriers, n=10 new strategies added).

Round 3

Measure. As in Rounds 1 and 2, respondents were emailed an individualized link to the Round 3 survey. The survey format mirrored Round 2. (1) Barriers: The survey illustrated

median and IQR values for barriers rated in Round 2, and respondents were provided the opportunity to re-rate all barriers on the importance dimension using the same 5-point Likert scale. Barriers written in during Round 2 (n= 7) were rated for the first time in Round 3. (2) Strategies: In addition to re-rating importance of strategies after viewing group consensus and agreement ratings, respondents were also instructed to rate feasibility of strategy implementation on a similar 5-point Likert scale (0= not at all feasible, 1 = slightly feasible, 2 = moderately feasible, 3 = very feasible, 4 = extremely feasible). Strategies written in during Round 2 (n = 10) were rated for importance and feasibility for the first time during Round 3.

Analyses. Consensus and agreement on importance for barriers and strategies in Round 3 was calculated based on median and IQR values. In addition, mean values were calculated for each strategy's feasibility and importance, and these were plotted on a bivariate graph, known as a Go-Zone plot, to identify strategies with ratings above the overall means of each dimension (Waltz et al., 2015; Lyon et al., 2019). This graph resulted in four quadrants, with strategies in Quadrant I representing those with high feasibility and high importance, Quadrant II with strategies high on feasibility, but low on importance, Quadrant III with strategies low on both variables, and Quadrant IV with strategies high on importance and low on feasibility.

Results

Demographics. Of the n=35 Round 1 sample, 65.7% participants (n=23) identified as white 11.4% (n=4) as Asian American, 8.6%, (n=3) as Latinx, 8.6% (n=3) as Multiracial, 2.8%, (n = 1) as Middle Eastern/North African, and 2.8%, (n=1) as Black/African American. Approximately half of the participants identified as male (n=18, 51.4%) and the mean respondent age was 45.2.

Barriers. In Round 1, consensus on level of importance ($IQR \leq 1$) was met for 12 of 19 (63.2% of barriers). In Round 2, consensus was met on 28 of 56 barriers (50%). In Round 3, consensus on level of importance was met on 61 of 63 barriers (96.8%). There was one additional barrier that met criteria for agreement on importance (median = 3), but not consensus ($IQR = 2$); however, there was no opportunity for experts to re-rate this barrier given it was generated in Round 2 and rated for the first and only time in Round 3. Within the final set of 63 barriers, 34.9% (n=22) were in the “user-related constructs” category, 33.3% (n=21) were in the “program-related constructs” category, and 31.7% (n=20) were in the “technology and environment related constructs” category. Respondents rarely indicated that barriers were pertinent for specific subsets of racial/ethnic groups, precluding meaningful analyses of these data. Of the 63 total barriers, respondents identified specific racial/ethnic groups for a total of n=10. All 10 barriers that respondents associated with specific subgroups had four or more total pertinent subgroups listed.

Of the 61 barriers that met consensus criteria in Round 3, 47.5% (n=29) had median ratings in the very to extremely important range. Of these 29 barriers, 31% (n=9) were in the user-related constructs category (e.g., beliefs about mental health, negative experiences with past providers, uncertainty about if treatment is needed), 37.9% (n=11) were in the program-related constructs category (e.g., lack of diverse representation in DMHI surface content, DMHI content centers white experiences) and 31% (n=9) were in the technology and environment related category (e.g., privacy and confidentiality concerns, cultural factors influencing help-seeking, concern about stigma by others). For a presentation of all barriers and agreement and consensus ratings, see Table 2.

Strategies. No consensus values were calculated for strategies in Round 1, because this phase of data collection included only generation, not rating, of strategies. The vast majority of respondents did not indicate that strategies generated in Round 1 were targeted for specific racial/ethnic groups, with only one respondent indicating that one strategy was relevant for a particular subgroup. In Round 2, consensus was met on 24 of 54 strategies (44.4%). In Round 3, consensus on level of importance was met on 64 of 64 strategies (100%). Of the 64 strategies that met consensus criteria in Round 3, 55 (85.9%) had median ratings in the very to extremely important range. Strategies were rated on the feasibility dimension only during Round 3. 49 strategies met criteria for consensus on feasibility level (76.6%), and 34 of these (69.4%) had median ratings in the very to extremely feasible range. An additional 12 strategies had median ratings in the very-extremely feasible range, but did not meet criteria for consensus ($IQR \leq 1$). For a presentation of all strategies and importance agreement and consensus ratings, see Table 3. Given that feasibility was rated only once (in Round 3), experts did not have an opportunity to re-rate after viewing the group consensus. For this reason, median and IQR values for feasibility ratings are not included in the table. Strategies are listed within the implementation level framework derived from the qualitative coding process described above.

The righthand column of Table 3 illustrates each strategy's corresponding go-zone quadrant. Figure 3 depicts these strategies mapped onto go-zones to illustrate relative importance and feasibility. Of the strategies, 39% (n=25) were in the high importance, high feasibility category (Go Zone I). 14% (n=9) were in the low importance, high feasibility category (Go Zone II), 21.8% (n=14) were in the low importance, low feasibility category (Go Zone III) and 25% (n=16) were in the high importance, low feasibility category (Go Zone IV).

Discussion

This study identifies a key set of barriers and strategies pertinent to DMHI uptake among college students of color and illustrates a process for establishing expert consensus on these barriers and strategies. A diverse group of experts was recruited for the study and retention rates between rounds were high, ranging from 62.9% to 80.0% overall and 45.5% to 80.0% among the subgroups. These rates compare favorably to previous Delphi studies on similar topics which had rates of 40% to 67% (Brouwer et al., 2008). Expert input was fruitful, leading to the identification of 63 barriers to DMHI uptake and 64 strategies to enhance user uptake among college students of color generated across the three rounds of the survey. Consistent with the modified Delphi method, we observed increased consensus on level of importance of barriers and strategies each round. As such, the method offered a useful and appropriate approach to aggregating expert opinion on this understudied topic.

With regard to barriers, the majority of barriers (97%) met criteria for consensus on level of importance, with experts agreeing that nearly half of these barriers fell in the very to extremely important range. Of note, these barriers were distributed evenly across user, program, and technology and environment constructs. This dispersion suggests that attention to barriers across multiple domains is needed to comprehend the array of obstacles to DMHI uptake for this population. This is particularly important, given that prior research on barriers to mental health treatment has emphasized individual-level barriers (e.g., perceived need for treatment, beliefs about mental health) (Eisenberg et al., 2011) that play a role in help-seeking, but less research has focused how structural and environmental factors shape mental health care experiences, beliefs, and inequities. These findings also align with ecological perspectives on engagement barriers to mental health care, suggesting that a combination of factors at various levels of one's

ecosystem (e.g., individual, family, service delivery) contribute to one's engagement with mental health services (Kim et al., 2012; McKay et al., 1996). Furthermore, our data strengthen support for the conceptual model for understanding barriers to DMHI developed by Borghouts and colleagues (2021), as all barriers in the current study fit within the constructs existing within this framework. Future research and implementation efforts should continue to build upon existing conceptual models to delineate barriers to DMHI uptake and engagement for specific subpopulations.

The two barriers identified as most important to influencing DMHI uptake for college students of color in this study included: mistrust of mental health services, systems and providers and lack of culturally-responsive services. While mistrust is often conceptualized as a barrier at the individual-level, historical and persistent abuse, mistreatment, and disregard of people of color in systems of care embody institutionalized practices that have deeply shaped and continue to perpetuate mistrust (Yearby, Clark & Figueroa, 2022; Feagin & Bennefield, 2014; Legha & Miranda, 2020). Accordingly, it is important to clearly acknowledge and address structural factors that contribute to mistrust in the context of barriers assessment and strategy development (Suite et al., 2007; Jaiswal, 2019). Other very important barriers related to mistrust identified by experts included lack of diverse representation within DMHI surface content, use of theories and modalities grounded in whiteness, and limited attention to the effects of racism on mental health and intersecting identities of students of color within DMHI content. These barriers may stem from and perpetuate medical and mental health system mistrust, through continued marginalization, exclusion, and lack of attention to issues faced by people of color.

The second most important barrier identified in this study was lack of culturally responsive treatment options. Prior research has similarly found that culturally unresponsive

services serve as a significant barrier to care for people of color (e.g., lack of language match, lack of ethnic match, and poor cross-cultural understanding) (Alegria et al., 2016). Findings from college student populations provide additional support for this key barrier. For example, one study found that Black and Latinx college students express desire for transparency about mental health providers' identities, are interested in having access to clinicians with whom they have shared identities, but report that information about therapist identities is often not available, buried, or difficult to find, representing another limitation to culturally responsive treatment (Williams et al., 2021). Several additional barriers identified as very important in this study are also aligned with prior research on mental health service use among college students of color. For example, stigma and shame, uncertainty about need for treatment, and limited awareness about how and when to seek treatment have been previously identified as barriers to help-seeking among college students of color (Dunley & Papadopoulos, 2019, Han & Pong, 2015). Together, these findings highlight that systemic and contextual barriers must be addressed in the implementation of DMHI within college student populations.

Our approach to examining strategies for enhancing DMHI uptake among college students of color attended to dimensions of importance and feasibility. Expert consensus on level of importance was met for 100% of strategies by Round 3. Upon examining each strategy on dimensions of both importance and feasibility, a smaller subset of strategies (n=25, 39.1%) emerged as relatively high on feasibility and importance. Of these, the majority were at the DMHI design and DMHI marketing/outreach levels, with fewer strategies from the DMHI onboarding/orientation and campus/community outreach levels. This pattern suggests that strategies of high importance and feasibility exist across levels of implementation and

emphasizes that approaches to optimize engagement should be multifactorial and comprehensive (Hermes et al., 2019).

The top five most important and highly feasible strategies were: (1) ensure representation of students of color exists across outreach and marketing materials, (2) ensure transparency about privacy policies, (3) streamline and reduce user burden associated with enrollment and initial use (e.g., make it easy to sign up and start), (4) codesign DMHI with students of color, (5) embed DMHI within existing campus and community resources and systems (e.g., mental health, academic, healthcare, student orgs). This set of top five strategies spans multiple levels of implementation and supports previously proposed approaches to improving DMHI engagement including: codesign with target population input (Mohr et al., 2017), ensure diverse representation (Ramos et al., 2021), optimize ease of use (Schueller et al., 2018), and integrate into existing health service infrastructure (Knapp et al., 2021). Some of these strategies have already been implemented in various settings (Bevan Jones et al., 2020; Rodriguez-Villa et al., 2020), but few studies have empirically tested whether these strategies are successful in improving DMHI uptake and engagement outcomes (Bevan Jones et al., 2020; Orłowski et al., 2015). More rigorous tests of strategy effectiveness are needed to determine the impact of these strategies.

The top engagement strategies identified in the current study are also aligned with implementation strategies derived from the Expert Recommendations for Implementing Change (ERIC) project (Powell et al., 2015; Waltz et al., 2015). The ERIC study identified a set of 73 expert-generated implementation strategies and organized them into nine key clusters. Strategies identified in our study can be conceptualized within several of these broader implementation strategy groupings. In our study, codesign of DMHI with students of color is aligned with ERIC

clusters focused on “engaging consumers” (e.g., involving patients/consumers/family members) and “developing stakeholder relationships” (e.g., building a coalition, identifying, and preparing champions). Our findings emphasize that engagement of stakeholders not just in the stages of innovation implementation, but also in the development of the innovation itself, is important for improving DMHI engagement. Streamlining and reducing user burden associated with DMHI enrollment and initial use also fits within the scope of ERIC strategies focused on “engaging consumers” (e.g., “intervene with patients/consumers and family to enhance uptake/adherence”, and “prepare patients to be active participants”). Our study strategies of ensuring diverse representation in DMHI marketing and outreach materials and ensuring transparency about DMHI privacy policies can be understood within the ERIC framework as “tailoring and adapting to overcome barriers and honor preferences”, given the need to design and market DMHI to specific user concerns and needs, in this case issues of representation and privacy. Last, our study identified embedding DMHI within existing infrastructure as a strategy for enhancing uptake among college students of color, which represents a contrasting approach to the ERIC strategy cluster “change infrastructure”. Rather than changing campus workflows and systems to better support DMHI implementation, experts in this study shared views that DMHI should be integrated within existing service delivery infrastructures to optimize college student of color uptake.

Given the dearth of previous literature on engagement strategies that focus on DMHI uptake for college students of color specifically, this study used a qualitative coding approach that emphasized the multi-level nature of DMHI design and implementation to categorize strategies. Strategies identified within each of the four levels of our model are also well supported by the broader digital mental health literature. Within the DMHI design level, optimal

strategies (with high importance and feasibility) focused on co-design with student stakeholders, integration of culturally relevant content into the DMHI, emphasis on acceptability and feasibility testing, and emphasis on designing simple and user-friendly interfaces. Indeed, codesign with stakeholders and inclusion of stakeholder-driven content within DMHI to ensure user needs and preferences are met have been deemed fundamental to achieving health equity in the digital mental health space (Friis-Healy, Nagy & Kollins, 2020). A recent systematic review on codesign of DMHI with young people highlighted that stakeholder involvement has evolved from taking a consultation approach to bona fide collaboration in recent years (Bevan Jones et al., 2020). Use of simple, easy-to-navigate, visually appealing interfaces are also widely recommended as key to successful DMHI implementation across populations (Mohr et al., 2018; Spadaro et al., 2021; Mohr et al., 2017; Schueller et al., 2018). Studies have shown that users who find DMHI to be visually appealing with clear interfaces report more positive experiences using these programs (Shi et al., 2021).

At the DMHI onboarding and orientation level, key strategies generated included streamlined procedures to reduce burden associated with enrollment and initial use, and addressing barriers and concerns through onboarding scripts. These strategies map onto recommendations to distribute educational materials about DMHI initiation processes and to identify point people to support users and trouble shoot technological issues in DMHI initiation (Graham et al., 2020). Our findings expand on these recommendations by suggesting that onboarding scripts can also address attitudinal (e.g. stigma), structural (e.g. limited resources) and other barriers to DMHI pertinent to college students of color. These scripts can be integrated into the DMHI onboarding process through human support features or using technology (e.g., videos, testimonials).

Within the DMHI marketing and outreach level, notable strategies included ensuring transparency about privacy policies and data security within marketing materials, framing DMHI using a variety of lenses (e.g., self-reliant way of coping, a way to integrate mental health into busy college lifestyle, as alternative to face-to-face therapy, using a strengths-based lens, emphasizing DMHI was designed for and by stakeholder groups when applicable). Aligned with these findings, prior research suggests that targeted marketing and branding strategies that advertise DMHI in ways that align with specific user group needs have potential to increase digital mental health uptake for college students of color (Rith-Najarian et al., 2019). For example, framing interventions as targeting “well-being” as opposed to “mental health” has been suggested by college student stakeholders to increase appeal of DMHI for this population (Lattie et al., 2020). Similarly, another study found Black and Latinx students described interest in engaging with more holistic mental health approaches that emphasize wellness, as opposed to deficits (Williams et al., 2021). Transparency about privacy policies and data security has also been identified as an important implementation strategy for DMHI more broadly, given significant user concerns about these issues (Graham et al., 2020).

Last, at the campus or community efforts level, key strategies included embedding DMHI within larger campus and community resources and systems (e.g., student organizations, existing service infrastructure), and disseminating psychoeducation about mental health and treatment broadly. These findings underscore that strategies targeting DMHI uptake should extend beyond the design, orientation to, and marketing of the innovation itself, and into the broader context in which the DMHI is adopted. Indeed, campus-wide, student-led mental health awareness campaigns have been found to decrease stigma related to help seeking among college students (Giroux & Geiss, 2019; Pace et al., 2018). Less is known about whether these interventions have

capacity to translate shifts in attitudes to behaviors (e.g., increased uptake), and additional research is needed to specify these effects, especially as they pertain to DMHI. Nonetheless, our study findings highlight that large-scale efforts to disseminate information about mental health and resources, and situating DMHI within existing campus mental health infrastructures, should be considered as strategies with potential to improve DMHI uptake for college students of color.

Limitations. This study has several notable limitations. First, although we recruited stakeholders from multiple expert groups, there are other key groups of experts who were not involved in the current study. In particular, student stakeholders were not identified and recruited for this study. Our findings represent one point of entry for developing strategies to enhance DMHI uptake for college students of color, but student expert stakeholder input and codesign is needed to make strategies successful. In addition, retention rates across rounds were somewhat lower for those in the industry stakeholder and racial/ethnic minority mental (REM) health expert groups (57.1% and 45.5% from Round 1- 3) compared to those in the DMHI in REM and DMHI in college student groups (71.4% and 70% from Round 1-3). However, even the lowest group's retention rate (45.5%) falls well within previously established rates of retention across rounds (Brouwer et al., 2008). While strategies in this study were coded using a deductive, data-driven approach, classifying them within specific levels of DMHI implementation, many of the key themes arising within each strategy can be integrated into engagement interventions across levels of implementation. For example, user-friendliness applies not only to the design of the DMHI itself, but also at the level of DMHI orientation (e.g., developing and implementing simple and visually appealing interfaces for onboarding) and marketing/outreach materials can similarly emphasize and advertise user-friendly interfaces and ease of use of DMHI. Another limitation is that a small proportion of barriers and strategies (those generated in Round 2) were

only rated once for importance, thus, experts were not given the opportunity to re-rate these barriers after viewing the group consensus. Similarly, experts rated strategies on the feasibility dimension only once, and were therefore unable to re-rate after viewing expert consensus on feasibility. Nonetheless, previous studies have involved expert rating of importance and feasibility of implementation strategies at a single time point, implicating the relative acceptance of this approach (Waltz et al., 2015; Lyon et al., 2019), and three rounds of a modified Delphi study design is standard in the literature (Trevelyan & Robinson, 2015). Last, students of color represent a large, heterogenous, and growing segment of the U.S. college student population, and there exists a tremendous amount of diversity between and within racial/ethnic groups, which was not accounted for within this study. Findings from this study should be tempered with this perspective in mind, and careful and thorough assessment of the unique needs of specific racial/ethnic groups of students can lead to improved precision and success of engagement strategies.

Conclusion. This study provides a key set of multilevel, expert-generated barriers to DMHI uptake and strategies to enhance DMHI uptake for college students of color, who represent a high need and underserved population. The subset of highly feasible and important engagement strategies derived in this study provides direction for prioritization of engagement interventions with most potential to improve DMHI implementation on diverse college campuses. These strategies should be tailored, augmented, tested, and implemented, in partnership with students of color themselves, with the goals of extending DMHI reach to mitigate mental health disparities.

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Tables

Table 1. Response Rates by Expert Group

Group Number	Group Description	Invitations	Round 1		Round 2		Round 3	
			n	Response Rate	n	Retention Rate	n	Retention Rate
Group 1	DMHI in REM	23	7	30.4%	7	100%	5	71.4%
Group 2	DMHI in College Students	35	10	28.6%	8	80.0%	7	70.0%
Group 3	REM Mental Health	46	11	24.0%	8	72.7%	5	45.5%
Group 4	Industry	35	7	20.0%	5	71.4%	4	57.1%
Total	All	139	35	25.2%	28	80.0%	22	62.9%

Note. Round 3 retention rate percentages reflect rates of retention from Round 1 to Round 3.. Abbreviations included in this table include: DMHI = Digital Mental Health Interventions, REM = Racial/Ethnic Minority.

Table 2. Barrier Importance Consensus Ratings

Barriers	Type of Barrier	Barrier Level	Round 1		Round 2		Round 3		
			M	I	M	I	M	I	
1	Beliefs about mental health	Beliefs	User	3	2	3	0	3	0
2	Personal stigma/shame	Beliefs	User	3	2	3	0	3	0
3	Believe other strategies work better (e.g., praying, alcohol)	Beliefs	User					3	1
4	Belief that mental health care is for severe problems	Beliefs	User			2	1	2	0
5	Belief that DMHI do not work	Beliefs	User			1.5	2.5	2	0
6	Negative beliefs about mental health due to media portrayals	Beliefs	User			1	1.25	1	1
7	Mistrust of mental health services, systems, and providers	Mental Health Exp & Skills	User	4	1	4	0	4	1
8	Unsure if treatment is needed	Mental Health Exp & Skills	User	3	1	3	0	3	0
9	Negative experiences with past providers	Mental Health Exp & Skills	User	3	1.5	3	0	3	0
10	Limited knowledge about how and when to seek treatment	Mental Health Exp & Skills	User			3	1.5	3	0
11	Microaggressions from previous providers	Mental Health Exp & Skills	User			2	2	2	0
12	Limited knowledge about mental health problems	Mental Health Exp & Skills	User			2	2	2	0
13	Limited knowledge about how treatment works	Mental Health Exp & Skills	User			2	2	2	0
14	Lack of empathy or understanding from previous providers	Mental Health Exp & Skills	User			2	2	2	1
15	Difficulty choosing DMHI based on empirical outcomes	Mental Health Exp & Skills	User					1	1
16	Do not know which app to use	Tech Experience & Skills	User	3	2	3	0	3	0
17	Do not know if could find suitable app	Tech Experience & Skills	User	3	1	3	0	3	0
18	Uncomfortable with using DMHI/apps	Tech Experience & Skills	User	2	1	2	0.25	2	0
19	Lack of awareness that help is available through DMHI	Tech Experience & Skills	User			2	1	2	0
20	Lack of knowledge about how to access apps	Tech Experience & Skills	User			1	1	1	0
21	Do not have time to use an app	Integration into Life	User	2	1	2	1	2	1
22	Limited physical space to privately use apps	Integration into Life	User			1	1	1	1
23	Lack of culturally responsive services/providers	Perceived Fit	Program	4	1	4	0	4	0
24	Do not see DMHI/apps as designed for BIPOC students	Perceived Fit	Program			2.5	1	3	0

25	Lack of diverse representation in DMHI surface content (e.g. imagery and language)	Perceived Fit	Program			3	1	3	0
26	DMHI use of modalities and theories grounded in whiteness	Perceived Fit	Program			2.5	2	3	0
27	Lack of culturally relevant content to BIPOC students within DMHI	Perceived Fit	Program			3	2	3	0
28	DMHI content centers white user experiences	Perceived Fit	Program			3	1.25	3	0
29	DMHI do not address effects of racism on mental health	Perceived Fit	Program			3	1.25	3	0
30	DMHI do not address intersecting identities of BIPOC students	Perceived Fit	Program			2.5	2	3	0
31	Lack of multilingual apps available	Perceived Fit	Program			2	1	2	0
32	Preference to deal with problems on own	Perceived Usefulness	Program	3	1	3	0	3	0
33	Preference to seek help from family and friends	Perceived Usefulness	Program	3	1	3	0	3	0
34	Uncertain how useful it will be	Perceived Usefulness	Program	3	0.5	3	0	3	0
35	Are not interested in using an app	Perceived Usefulness	Program	2	1.5	2	0	2	0
36	Do not see a need for an app	Perceived Usefulness	Program	2	1	2	0	2	1
37	Preference for face-to-face care from a mental health professional	Perceived Usefulness	Program	2	2	2	1	2	1
38	Competition for student attention for multitude of existing apps	Perceived Usefulness	Program			2	3	2	1
39	Reliance on cultural resources for mental health support	Perceived Usefulness	Program			1	2	1	1
40	Lack of option within app to connect with others	Social Con & Impact Interv	Program			1.5	2	2	0
41	Lack of data showing treatment effectiveness in BIPOC students	Social Con & Impact Interv	Program			2	1.25	2	0
42	Lack of evidence-based content with DMHI/apps	Social Con & Impact Interv	Program			2	1	2	0
43	Lack of knowledge about user design needs for this group	Social Con & Impact Interv	Program					2	1
44	Financial concerns	Tech, Privacy/Confidentiality	Tech & Env	3	1	3	0	3	0
45	Have concerns about privacy/confidentiality	Tech, Privacy/Confidentiality	Tech & Env	2	1	2	1	2	1
46	No access to technology (smartphone, computer) to use apps	Tech, Privacy/Confidentiality	Tech & Env					2	2
47	Digital overload	Tech, Privacy/Confidentiality	Tech & Env					2	1
48	Reliance on temporary phones	Tech, Privacy/Confidentiality	Tech & Env			1	2	1	0
49	Lack of access to devices needed to utilize DMHI/apps	Tech, Privacy/Confidentiality	Tech & Env			1	2	1	0
50	Limitations with regard to WiFi available for DMHI use	Tech, Privacy/Confidentiality	Tech & Env			1	1.25	1	1
51	Sharing phones with family members	Tech, Privacy/Confidentiality	Tech & Env			1	2	1	0
52	Fear of what others will think	Social Influence	Tech & Env	3	2	3	0	3	0

53	Concern about stigma from others	Social Influence	Tech & Env	2.5	1	3	0
54	Cultural understandings of mental health problems	Social Influence	Tech & Env	3	2.25	3	0
55	Cultural factors that influence help seeking	Social Influence	Tech & Env	2.5	2	3	0
56	Concern about parents finding out	Social Influence	Tech & Env	2	2	2	0
57	Using DMHI is not a norm in the community or among peers	Social Influence	Tech & Env	2	2	2	1
58	Lack of centralized resources for students to learn about and access DMHI	Implementation	Tech & Env	2.5	2	3	0
59	Lack of culturally specific marketing strategies that target BIPOC student users	Implementation	Tech & Env	2.5	1.25	3	0
60	Lack of inclusion of BIPOC students in DMHI design, advocacy, and outreach efforts	Implementation	Tech & Env	3	2	3	1
61	Competition for user attention from other non-MH digital apps	Implementation	Tech & Env			3	1
62	DMHI are not commonly integrated into most service offerings*	Implementation	Tech & Env			3	2
63	Advertising that centers white students	Implementation	Tech & Env	2	2	2	1

Note.

- Shaded items represent barriers meeting consensus criteria and agreement on high importance ($IQR \leq 1$, $median \geq 3$)
- *Asterisked items represent barriers meeting agreement on importance ($median \geq 3$) in Round 3, but for which there was no opportunity to re-rate for consensus because they were generated in Round 2
- Abbreviations:
 - M = Median, I = Interquartile Range (IQR)
 - Mental Health Exp & Skills = Mental Health Experience and Skills
 - Tech Exp & Skills = Technology Experience and Skills
 - Social Con & Impact Interv = Social Connectedness and Impact of the Intervention
 - Tech, P/C = Technology, Privacy/Confidentiality
 - Tech & Env = Technology and Environment

Table 3. Strategy Importance Consensus Ratings

#	Strategy	Strategy Level	Round 2		Round 3		Q
			M	I	M	I	
1	Co-design DMHI with BIPOC students	DMHI Design	4	1	4	0	I
2	Create culturally relevant and representative "deep" DMHI content (e.g., integrate intervention components that address key social determinants for BIPOC students)	DMHI Design	3	1	3	0	I
3	Create culturally relevant and representation "surface" DMHI content (e.g., language, physical appearance of models)	DMHI Design	3	2	3	0	I
4	Front load culturally relevant approaches and materials within DMHI content	DMHI Design	3	2	3	0	I
5	Ensure simple, user-friendly interfaces	DMHI Design	3	1	3	0	I
6	Employ acceptability and feasibility testing with end users throughout design process	DMHI Design	4	1	3	0	I
7	Include social elements within DMHI design (e.g. option to communicate with others)	DMHI Design	2	2	2	0	III
8	Integrate personalized screening, assessment and intervention within DMHI design	DMHI Design	3	1	3	0	III
9	Build in option to allow user to determine privacy settings	DMHI Design	3	1	3	0	I
10	Co-design service design with BIPOC students (i.e. where would students want to hear about the app, who would they want to hear about it from)	DMHI Design			3	1	I
11	Ensure routine outcome measures incorporated into DMHI are valid and meaningful for population	DMHI Design			3	1	IV
12	Ensure program designed to target outcomes and goals of interest to students of color	DMHI Design			4	1	I
13	Provide evidence within DMHI of demonstrated effectiveness with population	DMHI Design			3	1	III
14	Integrate into design how user plans to maximize benefit of program on device (e.g. where to put app, consideration of when/how would use it)	DMHI Design			3	1	II
15	Provide human coaching and support from individuals with shared identities	Onboarding	3	1.25	3	0	III
16	Integrate family members, friends, and other important people in DMHI treatment planning	Onboarding	2	1	2	0	III
17	Send electronic prompts (e.g. email, text, push notifications) to remind users about DMHI	Onboarding	2.5	1	3	0	I
18	Integrate time management and planning strategies to facilitate engagement (e.g. help user identify good times to use DMHI, troubleshoot barriers)	Onboarding	2	1	2	0	II
19	Integrate DMHI with other apps and technology use more broadly	Onboarding	2.5	1.25	3	0	III
20	Demystify DMHI and the process of initiating and using them	Onboarding	3	1.25	3	0	III
21	Streamline and reduce user burden associated with enrollment and initial use (e.g. make it easy to sign up and start)	Onboarding	4	1	4	0	I
22	Provide opportunities for users to give feedback on processes and illustrate integration of user feedback	Onboarding	3	1	3	0	I

23	Address common barriers and concerns through developing and implementing onboarding scripts that illustrate how DMHI can overcome barriers	Onboarding	3	1.25	3	0	I
24	Ensure low visibility access pathways that can optimize student privacy and confidentiality	Onboarding	3	2	3	0	IV
25	Provide training, tutorials and opportunities for trial runs using multiple methods (e.g. in-person tutorials, videos, webinars, etc). to increase user comfort, acceptability and ease of use	Onboarding	3	1.25	3	0	IV
26	Include motivational interviewing practices or components in onboarding/orientation procedures	Onboarding	2.5	2	3	0	III
27	Establish direct referral pathways with trusted community stakeholders	Onboarding	3.5	1.25	4	0	IV
28	Provide option for coaching support vs anonymous self-guided use	Onboarding			2	1	III
29	Develop strategies to enhance retention after uptake	Onboarding			3	1	IV
30	Highlight that DMHI have been designed for and by students of color (if applicable)	Marketing	3	1	3	0	I
31	Ensure representation of students of color exists across outreach and marketing materials	Marketing	3.5	1	4	0	I
32	Emphasize benefits, evidence, utility and value of DMHI in outreach and marketing materials	Marketing	3	1.25	3	0	I
33	Utilize numbers, data and evidence that illustrate DMHI utility and impact for students of color in outreaching and marketing materials	Marketing	3	1	3	0	III
34	Frame DMHI as an alternative to traditional, face-to-face therapy	Marketing	2.5	1.25	3	0	II
35	Frame DMHI as a point of entry to traditional therapy	Marketing	2	1.25	2	0	II
36	Messaging that student engagement with DMHI can also benefit friends, family and community	Marketing	2	2.25	2	0	II
37	Highlight autonomy, discretion and confidentiality of DMHI use (e.g. no need to go to a counseling center, can use anywhere)	Marketing	3	1.25	3	0	I
38	Frame DMHI as self-reliant and self-help way to cope with stress and mental health	Marketing	3	1.25	3	0	I
39	Employ strengths-based lens and use destigmatizing language to emphasize DMHI benefits (e.g. boost happiness and increase productivity) vs. deficit lens (e.g. manage stress and mental health issues)	Marketing	3	1.25	3	0	I
40	Ensure transparency about privacy policies	Marketing	3.5	1	4	0	I
41	Frame DMHI as having potential to fill gap in culturally responsive services	Marketing	3	1	3	0	II
42	Use word of mouth strategies to inform about existence and benefits of DMHI	Marketing	3	1.25	3	0	III
43	Partner with social media influencers to spread word and testimonials about DMHI	Marketing	3	2	3	0	IV
44	Use multimedia campaigns to promote awareness and messaging about DMHI	Marketing	3	2	3	0	IV
45	Utilize representative, tailored testimonials with culturally relevant examples to illustrate positive user experiences	Marketing	3	2	3	0	IV
46	Involve target group in outreach efforts	Marketing	3	1	3	0	I
47	Provide DMHI through campus resources (e.g. mental health providers, counselors, health center, student orgs)	Marketing	3	1	3	0	I

48	Emphasize and illustrate ease of use of DMHI (e.g. flexibility, convenience, simplicity, brevity, fit with routine)	Marketing	3	1	3	0	I
49	Include within materials that student group is involved in designing reach and uptake related strategies/materials	Marketing			3	1	II
50	Actively partner with student affairs/similar departments and work together to implemented multipronged outreach approach	Marketing			3	0	III
51	Emphasize advantages of DMHI as way to integrate attention to mental health into busy college lifestyle	Marketing			3	1	II
52	Develop specific rating systems for DMHI that account for student of color needs	Campus/Comm	2	2	2	1	III
53	Implement campaigns to destigmatize mental illness and promote well being	Campus/Comm	3	1.25	3	0	IV
54	Provide psychoeducation about mental health and information about resources and treatment	Campus/Comm	3	2	3	0	I
55	Normalize mental health concerns and help-seeking through multiple pathways (e.g. peer champions, campus groups, media campaigns)	Campus/Comm	3	1	3	0	IV
56	Centralize, simplify and streamline DMHI options and access for students	Campus/Comm	3	1.25	3	0	IV
57	Ensure students have information about and access to multiple DMHI (i.e. provide choices)	Campus/Comm	3	1	3	0	IV
58	Provide students with guides that overview pros, cons, and student reviews of various DMHI	Campus/Comm	2	2	2	0	II
59	Make DMHI low cost, free, sliding scale, or covered by university health insurance	Campus/Comm	4	0	4	0	IV
60	Embed DMHI within existing campus and community resources and systems (e.g. mental health, academic, healthcare, student orgs)	Campus/Comm	3.5	1	4	0	I
61	Increase diversity of mental health workforce through efforts to recruit and retain diverse students and staff in campus mental health spaces	Campus/Comm	4	1	4	0	IV
62	Incentivize use of DMHI through existing resources (e.g. class credit)	Campus/Comm	2	2	2	0	III
63	Use social media, websites, podcasts, webinars visited by students of color to promote messaging about mental health and wellness broadly	Campus/Comm	3	2	3	0	IV
64	Acknowledge and validate role of systemic racism and oppression contributing to both mistrust and mental health concerns among students of color	Campus/Comm	3	2	3	0	IV

Note.

- Gray shaded items represent strategies meeting consensus criteria and agreement on high importance (median ≥ 3 , IQR ≤ 1)
- Green shaded items met both consensus and agreement criteria, **and** fell within Go-Zone Quadrant 1 (high importance, high feasibility)
- Abbreviations:
 - M = Median Importance Rating, I = Interquartile Range (IQR), Q = Go-Zone Quadrant (I-IV)
 - Campus/Comm = Campus and Community Efforts
 - Marketing = Marketing & Outreach
 - Onboarding = Onboarding & Orientation

Figures

Figure 1. Barrier Framework



Figure 2. Strategy Framework

STRATEGY FRAMEWORK:
Characterizing strategies to enhance DMHI uptake for college students of color

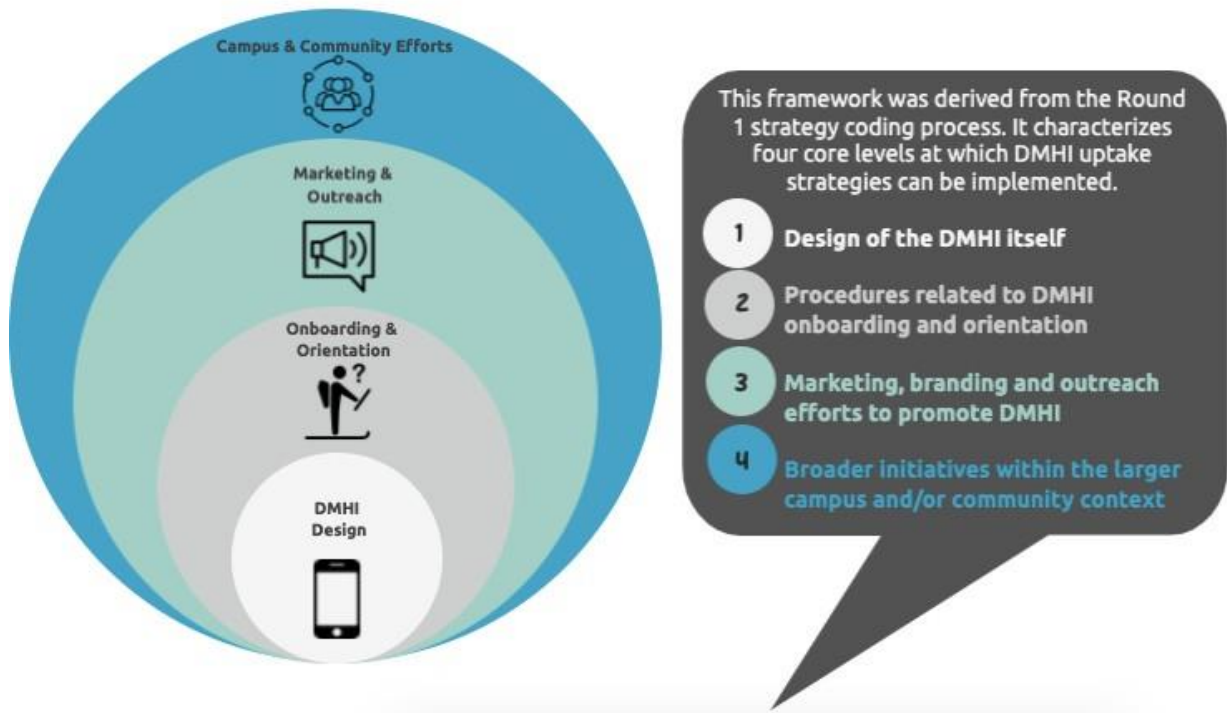
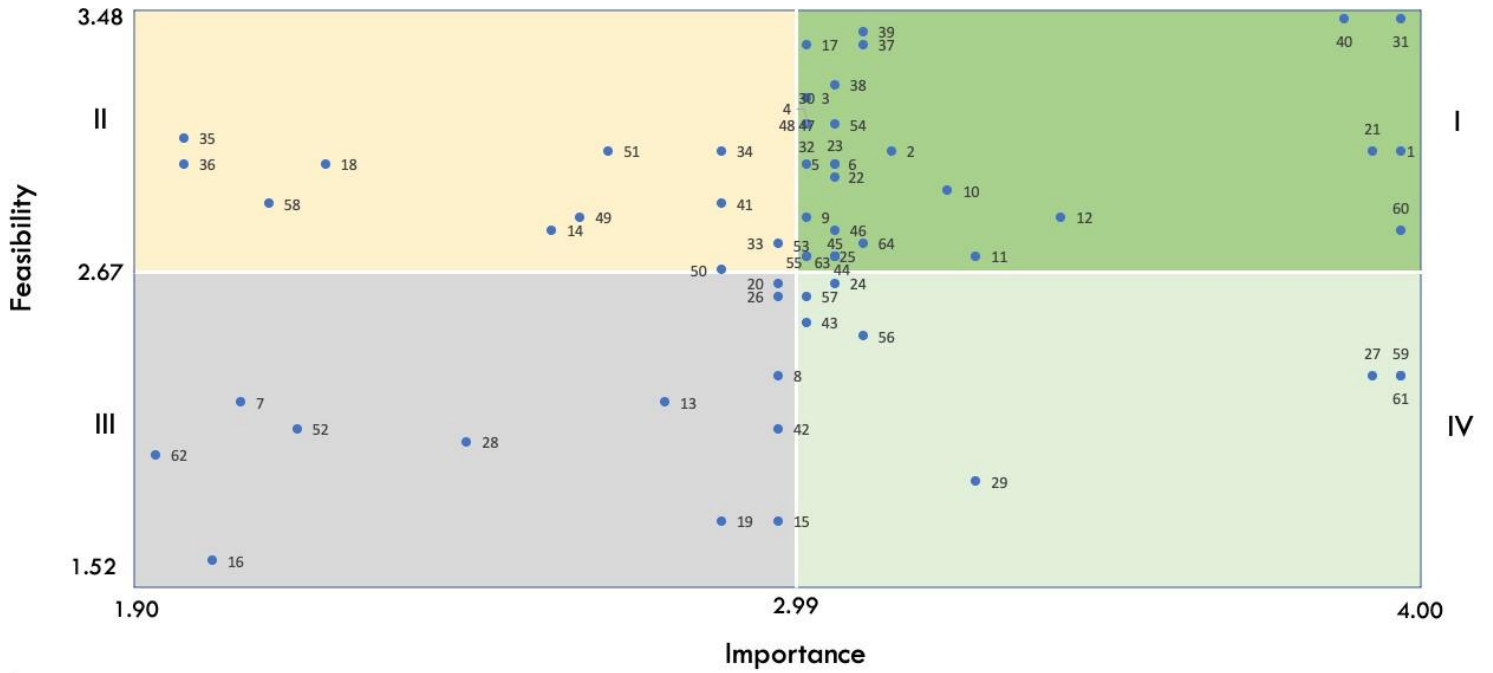


Figure 3. Go Zone Plot for Engagement Strategies



Note. Horizontal and vertical lines depict mean values for importance and feasibility. Zone 1 (upper right): relatively high importance and feasibility. Zone II (upper left): relatively low importance and relatively high feasibility. Zone III (lower left): relatively low importance and feasibility. Zone IV (lower right): relatively high importance and relatively low feasibility. The numbers in the plot map on to the strategies listed in Table 3.

Appendices

Appendix A: Study 1 Materials

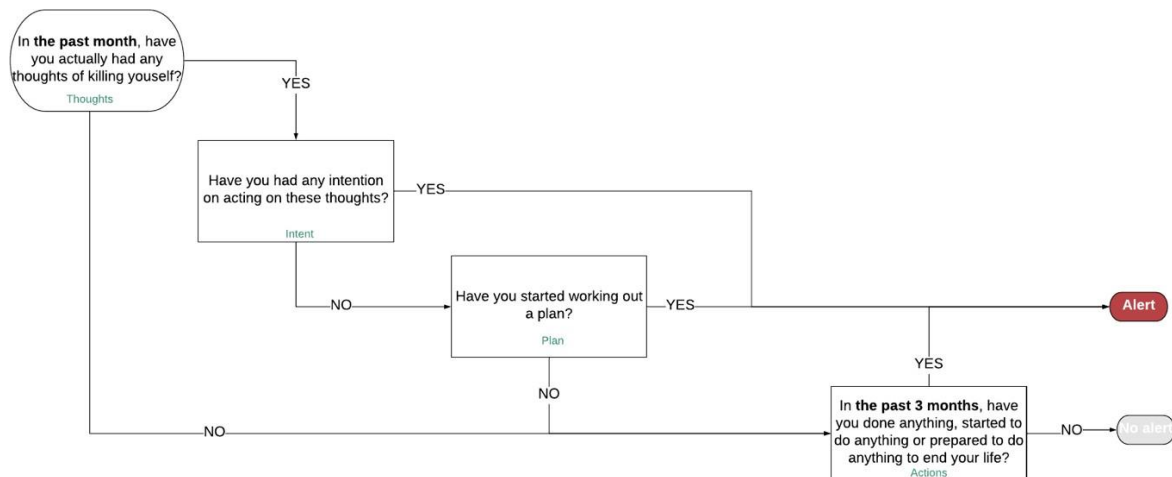
CAT-Anxiety Inventory Exemplar Items and Domains

Item Exemplar	Domain
In the past 2 weeks, I felt anxious or tense.	Mood
In the past 2 weeks, did you often, or were you told that you fidgeted to reduce your anxiety?	Behavior
In the past 2 weeks, I had difficulty concentrating.	Cognition
In the past 2 weeks, how much were distressed by feeling so restless you couldn't sit still?	Somatization

CAT-Depression Inventory Exemplar Items and Domains

Item Exemplar	Domain
In the past 2 weeks, how much did any feelings of depression bother you?	Mood- Negative Affect
In the past 2 weeks, how much were you able to relax and enjoy yourself?	Mood- Positive Affect
In the past 2 weeks, how much have you felt inferior to others?	Cognition
In the past 2 weeks, I felt that everything I did was an effort.	Behavior
In the past 2 weeks, my sleep was restless.	Somatization
In the past 2 weeks, did you think about taking your own life?	Suicidal ideation

Logic Flow for Positive Suicide Screen



Appendix B: Study 2 Materials

Round 1 Survey Link:

https://uclahs.az1.qualtrics.com/jfe/preview/SV_5hkxPJ4JQQE0pJY?Q_CHL=preview&Q_SurveyVersionID=current

Round 2 Survey Link:

https://uclahs.az1.qualtrics.com/jfe/preview/SV_2o4ulxhaXIq8jNY?Q_CHL=preview&Q_SurveyVersionID=current

Round 3 Survey Link:

https://uclahs.az1.qualtrics.com/jfe/preview/SV_bxfjDORvEIOtGWG?Q_CHL=preview&Q_SurveyVersionID=current

**Note: To scroll through surveys without responding to questions, select “tools” on the top right and “ignore validation”.*

Round 1 Recruitment Email:

Dear Dr. _____,

Our research team is conducting a study on digital mental health intervention engagement for college students of color. Our goal is to generate multidisciplinary expert perspectives on strategies to enhance uptake and equity in digital mental health programs for college students of color.

For Group 1-3 Experts: Through a systematic search, we have identified your company as a leader in the college student digital mental health arena.

[OR]

For Group 4 Experts: We are inviting you to participate in this study because of your research background in _____. We're eager to learn from your team's expertise.

We'd be asking participants to complete a series of three online questionnaires to identify barriers to digital mental health intervention uptake and strategies to improve uptake for college students of color. This is a paid opportunity and participants will receive up to \$100 in Amazon gift cards (Round 1 = \$50, Round 2 = \$25 and Round 3 = \$25). We expect Round 1 will take about 30 minutes to complete, Round 2, 15 minutes and Round 3, 5-10 minutes.

For Group 1-3 Experts: If you are interested in participating in this study, please follow the link below to complete the Round 1 questionnaire. We highly recommend taking this survey from a computer. The Round 1 survey will close on March 31, 2021. **Follow this link to the Survey:** `{l://SurveyLink?d=Take the Survey}`

[OR]

For Group 4 Experts: We are recruiting industry experts with experience in marketing and implementation of digital mental health tools within college student populations. We are looking for a representative at your company who has relevant expertise to participate in our study.

If you have this expertise and would like to participate, please reply to this email to let us know you're interested, and we'll send you the survey link. If you'd like to nominate a different member of your company's team, we'd love to get connected with them.

Thank you so much for your consideration!

Round 2 Recruitment Email:

Dear Dr. _____,

We are writing to provide you with the link for Round 2 of our Delphi study, focused on enhancing uptake and equity in digital mental health for college students of color. We are grateful for your participation in Round 1, and we are excited to learn more from you in Round 2.

In this round, you'll see expert consensus on the importance of the barriers you rated last time. You'll also have the chance to rate the barriers and strategies that you and other experts generated in Round 1. This is a great opportunity to learn more about your peer experts' impressions and ideas!

The window for Round 2 survey completion will close on August 1, 2021. We expect this round will take you about 20 minutes to complete. We suggest taking this survey from a laptop or computer. You'll receive a \$25 Amazon gift card when you complete this round.

After Round 2 data are analyzed, you'll receive a link for the final Round 3. After Round 3, you'll also receive a \$25 Amazon gift card, and an infographic brief report summarizing study findings.

Follow this link to the Survey: `{1://SurveyLink?d=Take the Survey}`

We welcome your feedback at any time throughout this study. If you have questions or would like to provide feedback, please contact Tamar: tamarkodish@ucla.edu

Thank you.

Round 3 Recruitment Email

Dear Dr. _____,

We are writing to provide you with the link for Round 3 of our Delphi study, focused on enhancing uptake and equity in digital mental health for college students of color. We look

forward to your participation in this third and final round.

The window for Round 3 survey completion will close on January 10, 2022. We expect this round will take you about 20 minutes to complete. We suggest taking this survey from a laptop or computer.

You'll receive a \$25 Amazon gift card when you complete the survey. Once all survey responses are collected, you'll also receive an Engagement Strategy Toolkit highlighting study findings.

We welcome your feedback at any time throughout this study. If you have questions or would like to provide feedback, please contact Tamar: tamarkodish@ucla.edu.

Follow this link to the Survey: [\\${1://SurveyLink?d=Take the Survey}](#)

Thank you.