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Using Mobile Health Applications for the Rapid Recruitment of Perinatal Women

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Abstract

Purpose.—This article describes how two research teams recruited participants using a mobile application for pregnant women.

Methods.—In both studies, a study description appeared on the home screen of a pregnancy application. Interested women were directed to a secure research website to enroll.

Results.—Enrollment goals were rapidly exceeded. Both studies enrolled participants from across the United States. Demographic diversity was achieved by one study.

Conclusions.—Mobile health applications are innovative venues for recruiting research participants.

Keywords

recruitment; pregnant women; cross sectional study; clinical trial

Meeting study recruitment goals in a timely manner is a common challenge. A review of 73 multicenter, randomized controlled trials in the United Kingdom, found only 55% enrolled their target sample size and 45% required a funding extension (Sully, Julious, & Nicholl, 2013). Enrolling ethnically diverse samples can also be challenging, particularly in studies focused on women (Killien et al., 2000). For mental-health researchers seeking to enroll perinatal women specifically, the stigma surrounding mental health concerns during the perinatal period may further impede recruitment (Tryphonopoulos & Letourneau, 2015). Moreover, in geographic locations outside of large metropolitan areas, researchers compete

for study participants from a limited subject pool of demographically homogeneous, perinatal women.

In contrast to traditional, local recruiting methods, mobile health applications have the potential to cast a far wider net and capture demographically diverse subject pools. From 2013 to 2015, the number of available mobile health applications increased by more than 100% (Aitken & Lyle, 2015). A 2013 search of iTunes and Google Play found 430 applications focused specifically on pregnancy (Tripp et al., 2014). Moreover, a survey of 410 Australian pregnant/postpartum women found 75% accessed at least one such application (Lupton & Pedersen, 2016). Indeed, one cross-sectional survey study, which utilized a parenting application to recruit women, efficiently enrolled 1083 postpartum women at a rate of 30 women per day (although this sample was not demographically diverse) (Leach, Butterworth, Poyser, Batterham, & Farrer, 2017). A recent U.S. survey found 83% of pregnant women indicated a willingness to use an Internet-based behavioral intervention, regardless of respondents' age, race, or income level (Urrutia et al., 2015).

This report addresses the promise of using mobile health applications to rapidly enroll large, demographically diverse samples of perinatal women. More specifically, we describe how two U.S. research teams utilized a mobile health application intended for pregnant women, to recruit pregnant participants for both a cross-sectional study and a clinical trial. The outcomes reported for each study include daily enrollment rate, sample size, and the demographic and geographic diversity of the study sample.

Methods

ovia Pregnancy Application

ovia Health is a women's health company that creates mobile applications addressing fertility, pregnancy, and parenting. The ovia Pregnancy application provides educational content, conducts recurring health assessments, collects health and demographic information and uses proprietary algorithms and machine learning to provide user-specific support and advice. As of July 2018, over 10 million women and families, worldwide, had used one of ovia's mobile applications, representing a diverse population throughout the U.S. and internationally. With IRB approval, the ovia Pregnancy application was used to recruit women for the two studies.

Study Recruitment and Enrollment Procedures

Study 1-BetterLife.

This cross-sectional study assessed the relationship between low back and pelvic pain, depression symptoms, and quality of life in a convenience sample of pregnant women in their third trimester.

To recruit, a study advertisement was displayed on home screens of users of the ovia Pregnancy application who were in their third trimester. The advertisement showed a racially diverse woman, to appeal to a broad range of racial groups. Interested women were directed to a secure, research website to confirm study eligibility: 18 years of age or older, English

speaking, and in their third trimester. Eligible women were invited to participate. Those who agreed gave informed consent and answered three questionnaires. Compensation (\$15) was mailed to those providing a postal address.

Study 2-Sunnyside.

This randomized clinical trial compared the efficacy of an *individual* versus *group* format of an online depression-prevention intervention.

Recruitment venues included University mass email, postal mail, Research Match, and the Ovia Pregnancy application. To recruit, Ovia Health targeted a study advertisement to the home-screens of Ovia Pregnancy application users who were between 16 and 25 weeks of pregnancy. Because this study sought women at risk for depression, interested women were linked to a secure, study website and asked to complete the Patient Health Questionnaire-8 (PH-Q; Kroenke, Spitzer, & Williams, 2001). Those with PH-Q scores between 5 and 14 were interviewed by a research team member to ensure that they did not meet the diagnostic criteria for Major Depression and were not receiving psychotherapy. The advertisement on the Ovia Pregnancy application homepage was periodically deactivated to allow interviewers time to complete this screening of the large number of interested women.

Results

BetterLife

Daily enrollment rate & sample size.—The BetterLife study advertisement was active for 3.5 days. Of the 181 women who clicked on the advertisement, 158 completed all of the study documents, well exceeding our original enrollment goal of 120 women. The enrollment rate was 45/day.

Demographic & geographic diversity.—The race/ethnicity composition of the BetterLife sample aligned with the 2016 U.S. census, although the BetterLife sample included slightly fewer ethnic-minorities (Table 1). One third of BetterLife participants were insured by Medicaid or had no insurance (35.08%), compared to 46.1% of the 2016 Census sample. The BetterLife sample was evenly distributed across the United States (Table 2).

Sunnyside

Daily enrollment rate & sample size.

The advertisement for Sunnyside was active for 92 days, in eight periods of varying duration, ranging from one day to three weeks. Of the 2,062 women who clicked on the study advertisement, 930 met both the PH-Q and interview criteria. The enrollment goal (N=110) was exceeded by almost two fold: 210 women were randomized at a rate of two women/day. Among all recruitment venues, the Ovia pregnancy application recruited 93% of participants.

Demographic & geographic diversity.

The majority of Sunnyside participants were Caucasian (Table 1), with 11.9% being of Latina/Hispanic ethnicity, with a broad range of educational-attainment, although the distribution skewed toward better educated (Table 1). The enrollees' zip codes were evenly distributed across the United States (Table 2).

Discussion

Researchers often struggle to recruit sufficient study participants in a timely manner. By utilizing the Ovia Pregnancy application, here, both studies rapidly exceeded recruitment goals. The daily enrollment rate was 45/day in the BetterLife study and 2/day in the Sunnyside study. Although the daily enrollment rate was significantly higher for the BetterLife study, the Sunnyside trial had more inclusion/exclusion criteria and a considerably higher participation burden, with at least 20 weeks of participation and five assessments. Sunnyside's daily recruitment rate of 2/day was equivalent to the 3/day achieved in a similar clinical-trial evaluation of an online depression intervention for adults in the general population (Morgan, Francis, & Mackinnon, 2013).

Enrolling a demographically diverse sample is another frequent challenge, particularly for research teams located in non-metropolitan areas. By utilizing the Ovia Pregnancy application, BetterLife was able to recruit a sample that closely mirrored the U.S. population, in terms of race/ethnicity and insurance type. This achievement is particularly promising given the historic barriers of enrolling ethnic minorities in research (Killien et al., 2000). In contrast, ethnic-minority participants were not well represented in Sunnyside, and the majority of the sample was highly educated. BetterLife's success in recruiting a racially/ethnically diverse sample may be due to advertising imagery that was tailored to be culturally inclusive. It is also possible that the higher participation burden of Sunnyside reduced interest. Although not used in this study, Ovia Health does have the capacity to ensure study advertisements are viewed by diverse groups, a strategy that might be used in future studies. Finally, the online recruiting strategy was regionally representative, in that it gathered study samples that were distributed relatively evenly, across the eastern, central, and western regions of the United States.

A key limitation of this descriptive analysis is that comparing enrollment rates across venues was not objective of either study. Nevertheless, the observation 93% of Sunnyside participants had enrolled via the Ovia Pregnancy application among all the recruitment venues, provides a limited comparison. In line with recommendation to systematically investigate recruitment strategies (Le, Lara, & Perry, 2008), we encourage future studies to directly compare different recruitment venues.

Recruitment through mobile health applications may not be feasible for all types of studies, particularly for clinical trials that require face-to-face contact with participants (e.g., as in the case of emergent clinical risk or safety issues). Yet, despite potential limitations, recruitment via mobile health applications removes a number of barriers that often prevent study participation, particularly by under-represented, ethnic-minority women. Mobile applications can provide scheduling flexibility, remove the need for transportation, and

ensure privacy, which may reduce the stigma of study participation, particularly in studies investigating mental health.

Conclusions

For researchers in perinatal mental health, mobile health applications offer a promising strategy for rapidly recruiting large, diverse samples of research participants worldwide. Our descriptive comparison of recruitment via traditional methods vs. online methods in the Sunnyside trial showed the latter accounted for the majority of women enrolled. Experimental studies designed to compare recruitment venues points to an important direction for future research.

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Table 1

Demographic distribution of the two study samples, compared to 2016 U.S Census Bureau data

BetterLife			
	Number	Percent	U.S. Census 2016¹
Race/Ethnicity			
Caucasian/not Hispanic	107	67.72	61.3
African-American	17	10.76	13.3
Native American	2	1.27	1.3
Hispanic/Latina	21	13.29	17.8
Asian/Pacific Islander	3	1.90	5.9
Other/two or more races	6	3.80	2.6
Did not report	2	1.27	---
Type of Insurance			
Commercial/Private	87	55.06	67.5
Medicaid	51	32.28	37.3
None	6	3.8	8.8
Prefer not to answer	14	8.86	--
Sunnyside			
Race	Number	Percent	U.S. Census 2016¹
Caucasian	175	83.33	76.9
African-American	7	3.33	13.3
Asian	6	2.86	5.7
Native American	0	0	1.3
Native Hawaiian/Other Pacific Islander	2	0.01	.2
More than One Race or Other	18	8.57	2.6
Did not report	2	0.01	--
Ethnicity			
Hispanic/Latina	25	11.9	17.8
Education			
Less than HS	2	1.0	12.3
High School Diploma/Equivalent	12	5.7	26.9
Post High School	54	25.7	21.2
Associate Degree	18	8.6	9.0
Bachelor	71	33.8	19.0
Graduate/Professional Degree	49	23.3	11.5
Other/Did not report	4	1.9	--

Note. United States Census Bureau 2016 obtained from <https://www.census.gov/quickfacts/fact/table/US/PST045216>

Table 2

Geographic distribution of women who provided zip code information in the two study samples

Location	BetterLife Percent (n)	Sunnyside Percent (n)
East	33.6% (37)	36.1% (76)
Central	38.1% (42)	36.7% (77)
West	27.3% (30)	27.1% (57)
Number of women providing zip code	110	210

Note: The three categories of zip code locations were based on the first digit of the zip code: East (codes 0–3); Central (codes 4–7) and West (codes 8–9).