

Original Research

Rural and Urban/Suburban Families' Use of a Web-Based Mental Health Intervention

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Abstract

Background/Introduction: Access to mental healthcare among rural residents is a national concern because unique barriers (e.g., fewer providers, distance to services) create significant challenges for the 60 million Americans who live in these settings. There is now a large body of literature demonstrating the efficacy of a wide range of Internet-based interventions. However, little is known about the extent to which individuals in rural settings will use these approaches and find them acceptable. Research with youths and their caregivers within this scope is particularly limited and, therefore, of great importance. **Methods:** We examined access and completion of a Web-based disaster mental health intervention in a population-based sample of 1,997 rural (n=676) and urban/suburban (n=1,321) adolescents and their caregivers who were affected by the Spring 2011 tornadoes that touched down in parts of Missouri and Alabama. **Results:** Results indicated no differences in the rate of access or completion of Web-based modules based on geographical location. Furthermore, for those who did not access the Web-based resource, no differences were observed with respect to reasons for not accessing modules based on geographical location. **Discussion:** These data have promising implications for the reach of Web-based resources to both rural and urban/suburban communities, as well as the willingness of adolescents and their caregivers to access and complete such resources, regardless of geographical location.

Keywords: e-health, behavioral health, technology, disaster medicine

Introduction

Approximately, 60 million U.S. residents (19.3% of the national population) live in rural settings.¹ The prevalence of psychiatric illness is ~25% in rural settings.² Prevalence of individual psychiatric diagnoses is generally similar to urban/suburban residents across disorders.³ For example, rural residents have similar risk to urban/suburban residents for the development of affective, trauma-related, and psychotic disorders⁴; however, data suggest that rural youths and adults have increased risk for substance use disorders and suicide.^{5,6} Taken together, these data indicate an equivalent need for mental health services between rural and urban residents.

Despite experiencing similar prevalence of mental illness, rural residents are less likely to receive both mental and physical healthcare in comparison to urban residents.⁷ In addition to decreased anonymity and perceived stigma associated with mental healthcare,^{8,9} rural families face a shortage in mental healthcare professionals¹⁰ and also experience unique barriers to mental healthcare such as limited transportation, geographic remoteness, low socioeconomic status, low educational achievement, and low rates of insurance coverage.¹¹ Thus, novel solutions are needed to increase the reach of evidence-based interventions in a way that addresses barriers associated with cost, transportation, and stigma.

Approximately 59–61% of U.S. adults report using the Internet to gather health-related information and 28% reported Internet use to gather information about mental health problems. Furthermore, rural and urban/suburban residents do not differ in overall rates of healthcare information seeking.^{12,13} Although research shows that adults in rural settings have traditionally lagged behind those of urban/suburban residences in their Internet use, data suggest rapid increases in Internet use by rural residents during the past decade, and this gap is closing.¹⁴ Current differences may be accounted for, in part, by the older average age and lower average socioeconomic status of rural adults.^{15,16} Furthermore, although 52% of rural adults have a smartphone, which is 16% and 14% points below individuals from urban and suburban areas, respectively, this gap also appears to be closing and once again,

differences are likely accounted for by differences in average age and socioeconomic status.¹⁷ The use of technology by rural adolescents is also growing as 68% of rural adolescents own a smartphone, 59% have desktop/laptop access, 55% have access to a tablet pc, and 91% use the Internet on a mobile device. These rates do not differ significantly among adolescents in rural, urban, and suburban settings.¹⁸

Innovative approaches are needed to increase reach and dissemination of evidence-based practice to these populations. Advancements in technology (e.g., Web- and app-based mental health interventions) hold potential to increase access of evidence-based care to traditionally underserved populations, such as rural residents.¹⁹ Increases in Internet/smartphone use have opened encouraging and novel outlets for mental healthcare dissemination and delivery efforts, particularly in rural communities. Although many successful efforts have been underway to bring technology-based solutions to rural Americans (e.g., telehealth; see Benavides-Vaello et al.²⁰ for a review), less is known about Web-based self-care solutions which might also be of value in improving reach to quality mental healthcare. Promisingly, Web- and mobile-based intervention resources for mental and behavioral healthcare also have begun to show promise with regard to feasibility, acceptability, and efficacy in rural adolescents and adults.²¹⁻²³

In summary, technology-based solutions may improve the reach of mental healthcare to rural communities. Given the increasing rates of Internet access and use among rural residents, particularly as a resource for mental healthcare information and delivery, it will be important to gain a better understanding about whether Web-based mental health outreach efforts result in similar rates of access and completion of intervention resources between rural and urban/suburban residents. The current investigation examined access and completion of a Web-based disaster mental health intervention for adolescents and their caregivers based on geographic location. The intervention consisted of an integrated self-help and parent-assisted intervention, both of which were focused on strategies to improve adolescent recovery after disaster.²⁴ All participants recruited into the study reported through eligibility screen that they had household Internet access; this eliminated potential confounds associated with differences in household Internet in rural versus urban settings. Thus, the current exploratory study sought to examine whether differences exist in access and completion of this Web-based resource between rural and urban families. In particular, potential differences for the following variables were examined: (1) rates of access to the Web-based resource, (2) the number of modules accessed, (3) rates of completion of the resource's modules, and (4) the number of modules completed.

Methods

PROCEDURE

Address-based sampling was used to recruit a population-based sample of 2,000 disaster-affected families following the 2011 tornadoes in Alabama and Missouri (see Ruggiero et al.²⁵ for detailed sampling strategy). Families who spoke English and had a child between the ages of 12 and 17 years, and also whose residence was noninstitutional, had a cell phone or landline telephone, and had home Internet access were eligible to participate. After providing a detailed description of the study, verbal informed consent/assent was obtained from caregivers and adolescents. For households with multiple eligible adolescents, one was selected at random. Adolescents and a designated caregiver participated in a telephone-based interview by highly trained staff using computer-assisted telephone interviewing. This interview assessed demographics, disaster impact, and postdisaster mental health functioning. After a baseline interview, families were given access to the resource with unique login information. During a four-month follow-up interview, caregivers who did not access the resource were asked about their lack of access. Families were compensated \$25 for accessing the Web-based resource and \$15 for the completion of each interview.

PARTICIPANTS

Invitations to access the resource were sent to 2,000 families; 1,997 of which had rural/urban classification data according to U.S. census zip code information. Of these families, 1,321 (61.6%) lived in urban/suburban areas and 676 (33.9%) lived in rural areas. Rural and urban/suburban samples did not differ significantly in age or sex for both adolescents and their caregivers. Significant differences were observed between rural and urban/suburban samples for adolescents' race, $\chi^2(2, 1982) = 141.949, p < 0.001, \Phi = 0.268$; caregivers' race, $\chi^2(2, 1779) = 148.116, p < 0.001, \Phi = 0.289$; caregiver's relationship status, $\chi^2(1, 1997) = 17.504, p < 0.001, \Phi = 0.094$; and caregivers' level of education, $\chi^2(3, 1996) = 95.053, p < 0.001, \Phi = 0.205$. Participant demographic data are displayed in *Table 1*.

INTERVENTION

After initially accessing the Web-based intervention, some adolescents and their caregivers were assigned to an assessment only condition around common mental health reactions to disaster (control condition), whereas others were provided access to an assessment plus educational/training resources (intervention condition).^{24,25} The intervention condition allowed adolescents to access up to four modules that provided evidence-based strategies for reducing symptoms of post-traumatic stress disorder (PTSD) depression, cigarette use, and

alcohol use. Caregivers assigned to the intervention condition were provided a parenting module that offered education in child monitoring, parent child communication, and behavior management strategies relevant to emotional and behavioral functioning in children. Half of these caregivers also were provided the option to access self-help modules aimed at reducing their own symptoms of PTSD, panic, mood, and tobacco and alcohol use. Adolescents and their caregivers were able to access modules based on their preference, and all participants were provided with the option to complete or opt out of a module at any time (see Ruggiero et al.²⁵ for a detailed description and the evidence-based development of study conditions and modules). Control condition content included modules to assess knowledge of a given disorder without providing specific intervention components or feedback. Control participants also did not receive the interactive components (e.g., graphics, videos, activities within the

module) or educational materials that were part of the experimental condition.

DATA ANALYSIS

Access was defined as having started an intervention module, and completion was defined as having reached the last screen of a module. Access was calculated by dividing the number of participants who accessed at least one module by the total sample size. Completion was calculated by dividing the number of participants who completed a module by the total number of participants who accessed the module. Logistic regression analyses were used to examine prediction of categorical variables (access/completion vs. no access/completion) based on geographic setting (rural vs. urban/suburban), the results of which are displayed in Table 2. Linear regression analyses were used to examine prediction of the number of modules accessed/completed based on geographical location

Table 1. Participant Demographics

VARIABLE	RURAL ADOLESCENTS		URBAN/SUBURBAN ADOLESCENTS		RURAL CAREGIVERS		URBAN/SUBURBAN CAREGIVERS	
	M	SD	M	SD	M	SD	M	SD
Age	14.50	1.76	14.59	1.74	45.04	9.54	45.43	9.38
	N	%	N	%	N	%	N	%
Sex								
Female	329	48.7	658	49.8	493	72.9	980	74.2
Male	347	51.3	663	50.2	183	27.1	341	72.9
Race ^a								
White	563	89.1	715	62.3	563	89.1	832	63.4
Black	53	8.4	384	33.5	53	8.4	423	32.2
Other	16	2.5	48	4.2	16	2.5	57	4.3
Relationship status								
Not partnered	–	–	–	–	135	20.0	378	28.6
Partnered	–	–	–	–	541	80.0	943	71.4
Education ^a								
<12 years	–	–	–	–	65	9.6	62	4.7
HS diploma	–	–	–	–	197	29.1	235	17.8
Some college	–	–	–	–	248	36.7	460	34.8
College grad	–	–	–	–	166	24.6	563	42.7

^aDescriptive statistics are based on valid cases for the given variable; median income was 40,000 to 60,000 for Rural and Urban/Suburban families.

M, mean; SD, standard deviation.

Note: n = 1,997.

Table 2. Logistic Regression Predicting Access/Completion by Location

	%	WALD	SIG.	OR	95% CI	R ² _{NAG}
Adolescent access		2.711	0.100	1.178	0.969-1.433	0.002
Urban/suburban	36.7					
Rural	33.0					
Adolescent completion		0.776	0.378	1.185	0.812-1.730	0.002
Urban/suburban	79.2					
Rural	76.2					
Caregiver access		2.502	0.114	1.169	0.963-1.419	0.002
Urban/suburban	38.1					
Rural	34.5					
Caregiver completion		3.515	0.061	1.351	0.986-1.851	0.006
Urban/suburban	62.2					
Rural	54.9					
Adult self-help access		3.365	0.067	1.212	0.987-1.490	0.002
Urban/suburban	31.0					
Rural	27.1					
Adult self-help completion		1.071	0.301	1.221	0.837-1.780	0.003
Urban/suburban	72.0					
Rural	67.8					

95% CI, 95% confidence interval; OR, odds ratio; R²_{Nag}, Nagelkerke R square; Sig., level of significance; Wald, Wald statistic.

CAREGIVERS LIVING IN RURAL AND URBAN/SUBURBAN AREAS

Access of intervention modules. Geographical location did not significantly increase the likelihood of caregivers’ access of the resource. Similar to adolescents, roughly one in three caregivers accessed the resource for the urban/suburban ($n=503$; 38.1%) and rural ($n=233$; 34.5%) samples. Caregivers living in urban/suburban areas accessed more modules compared to those living in rural settings. This mean difference accounted for a small proportion of the variance in access ($R^2=0.002$) and the effect size for the difference was small (Cohen’s $d=0.11$).

Completion of intervention modules. Geographical location did not significantly increase the likelihood of caregivers’ completion of the resource. The overall completion rate was 62.2% ($n=313$) and 54.9% ($n=128$) for urban/suburban and rural caregivers, respectively. Geographical location did not predict the number of modules completed by adolescents.

Access of self-help modules. Geographical location did not significantly increase the likelihood of caregivers’ access of the self-help modules. Adults living in urban/suburban

and these results are displayed in *Table 3*. Rural geographical status was used as reference category for all analyses.

Results

ADOLESCENTS LIVING IN RURAL AND URBAN/SUBURBAN AREAS

Access of intervention modules. Geographical location did not significantly increase the likelihood of adolescents’ access of the resource. Specifically, roughly one in three adolescents accessed the resource for the urban/suburban ($n=485$; 36.7%) and rural ($n=223$; 33.0%) samples. Geographical location did not predict the number of modules accessed by adolescents.

Completion of intervention modules. Geographical location did not significantly increase the likelihood of adolescents’ completion of the resource. The overall completion rate was 79.2% ($n=384$) and 76.2% ($n=170$) for urban/suburban and rural adolescents, respectively. Geographical location did not predict the number of modules completed by adolescents.

areas were just as likely as those living in rural areas to access the self-help resource. Slightly less than one in three adults accessed the self-help resource for the urban/suburban ($n=410$; 31.0%) and rural ($n=183$; 27.1%) samples. Geographical location did not predict the number of self-help modules accessed by adults.

Completion of self-help modules. Geographical location did not significantly increase the likelihood of caregivers’ completion of the resource. The overall completion rate was 72.0% ($n=295$) and 67.8% ($n=124$) for urban/suburban and rural caregivers, respectively. Geographical location did not predict the number of modules completed by adolescents.

REASONS FOR NONACCESS

Rates of endorsement for reasons for not accessing the resource are displayed in *Table 4*. Chi square analyses did not reveal significant differences in reasons for nonaccess between caregivers living in urban/suburban versus rural areas.

Table 3. Regression Predicting Number of Modules Accessed/Completed by Location

	M (SD)	β	T	SIG.	R ²
Adolescent modules accessed		-0.136	-1.903	0.057	0.001
Urban/suburban	1.00 (1.53)				
Rural	0.87 (1.45)				
Adolescent modules completed		-0.017	-0.442	0.659	-0.001
Urban/suburban	1.82 (1.43)				
Rural	1.85 (1.45)				
Caregiver modules accessed		-0.048	-2.156	0.031	0.002
Urban/suburban	1.06 (1.12)				
Rural	0.94 (1.08)				
Caregiver modules completed		-0.103	-1.359	0.176	0.005
Urban/suburban	3.36 (0.64)				
Rural	3.21 (0.74)				
Adult self-help modules accessed		0.004	0.070	0.945	-0.003
Urban/suburban	4.97 (0.16)				
Rural	4.97 (0.16)				
Adult self-help modules completed		-0.172	-0.910	0.364	-0.001
Urban/suburban	2.80 (1.40)				
Rural	2.62 (1.48)				

β , standardized regression coefficient; R², adjusted R square.

The most common reasons for nonaccess included being too busy, forgetting to access the site, or that the site was not relevant to their present concerns. Approximately, one fourth of caregivers who did not access the site stated that it was not relevant to current concerns. Less common reasons for not accessing the site included feeling that the site would not likely be helpful, not having Internet access at the time, having trouble using the site, and concerns about privacy or security.

Discussion

The present study examined access and completion of a Web-based intervention among disaster-affected rural and urban/suburban families. Adolescents and caregivers from rural settings accessed the Web-based resource at similar rates to those living in urban/suburban settings. This pattern held true with respect to the number of modules accessed by adolescents from the two communities, although caregivers from rural settings accessed slightly fewer modules. The mean

difference between caregivers from these two settings accounted for a small proportion of the variance and the effect size was small. Adolescents and caregivers from both geographic locations completed resource modules at similar rates once the modules had been initially accessed, and similar results were observed for the number of modules that were completed. Furthermore, results were similar for caregivers' access and completion of self-help modules.

The lack of significant differences in likelihood and comparable rates of access/completion of modules, regardless of generation or geographical location (adolescent vs. caregiver; rural vs. urban/suburban), suggest that rural families may be just as likely as those from urban/suburban families to make use of Web-based mental health interventions when provided with the opportunity. These findings are novel and extend recent data demonstrating feasibility, acceptability, and efficacy of technology-based resources in rural populations, particularly with younger generations.²¹⁻²³ This is noteworthy as rural residents are typically underserved in the United States and are less likely to receive healthcare for mental illness despite experiencing rates of psychiatric disorders similar to those in urban settings.^{7,11} Technology-based solutions such

as the Web-based intervention described in the present study, thus, hold great potential for overcoming some of the barriers to mental healthcare experienced by this population (e.g., limited number of and access to experienced mental health professionals) by providing the much needed education, support, and continuity of care that are generally lacking in these areas.²⁶ Additional research examining the ability of Web-based self-care resources to overcome specific barriers is warranted, as has been addressed in areas such as telehealth (e.g., Benavides-Vaello et al.²⁰). The increased understanding gained from this line of research will allow for the tailoring of these resources to specific patient populations that may differ in the barriers that they experience.

The translation of self-help programs (including Web-based programs) to portable mobile devices such as smartphones and tablet-PCs has also received increased attention in mental healthcare and have shown efficacy in recent early investigations.²⁷ Given the recent and continued rise in smartphone

Table 4. Reasons for Nonaccess

VARIABLE	URBAN/SUBURBAN		RURAL	
	ADOLESCENTS			
	N	%	N	%
Too busy	145	75.9	76	72.4
Not relevant to current concerns	52	27.8	25	24.0
Did not feel it would be helpful	40	21.2	16	15.5
Had trouble using it	22	11.6	10	9.6
Concerned about security	10	5.2	11	10.6
Concerned about privacy	7	3.7	5	4.8
CAREGIVERS				
	N	%	N	%
Too busy	140	61.9	75	66.4
Forgot to use it	115	50.7	49	44.1
Not relevant to current concerns	52	23.4	33	29.5
Did not feel it would be helpful	37	16.9	17	15.9
Concerned about privacy	35	15.5	21	18.6
Had trouble using it	34	15.0	13	11.7
Concerned about security	32	14.2	15	13.4

Note: Percentages are based on valid cases for a given variable.

and tablet-PC access and use in rural residents,^{17,18} as well as the ready accessibility of these devices during regular day-to-day activity, the transportability of evidence-based self-help and provider-supervised interventions to these communities may improve. Moreover, the integration of these mobile applications with other technology-based healthcare delivery approaches may, once again, show incremental effects on patient outcomes and provide tracking of patient progress. The results of this study indicate that reasons for not accessing the Web-based resource did not vary significantly based on geographic location and that the most commonly reported reasons for nonaccess included being too busy and forgetting to access the site. As such, mobile-based solutions may be increasingly helpful as they can include features such as reminders, notifications, and motivational content help to overcome these particular barriers.

This investigation has some limitations that may inform future work. The first is that participants were personally invited to access the intervention and were compensated for their participation. Thus, access and completion may be meaningfully different in the context of a true dissemination

initiative with disaster-affected communities. A second limitation was that the current study did not evaluate processes stratifying those who accessed/completed and did not access/complete across rural and urban settings, which would have provided useful information for future dissemination efforts. Third, given that the sample was population based rather than comprising of treatment seeking, high risk, or shelter-recruited patients, rates of access and completion may differ from rates of higher-risk patients for whom the relevance of this population may have been higher on average (the prevalence of PTSD and major depressive disorder was low among adolescents recruited into this sample²⁸). Specifically, the public health approach used in this study was not intended to focus strictly on families at the very highest levels of risk. The goal instead was to examine an intervention that had potential to reduce symptoms and accelerate recovery at the population level for families who experienced level of risk. Therefore, from a dissemination perspective, increasing potential reach and availability of evidence-based resources to the general population was our highest priority.

In conclusion, the findings of the present investigation suggest equivalent willingness to access and complete Web-based intervention resources for adolescents, their caregivers, and adults seeking help for themselves. This provides numerous implications for the ability to reach rural communities with Web-based self-help resources. Additional areas for future research include the examination of specific barriers (e.g., stigma and limited psychoeducation) to accessing these resources to improve initial uptake of Web-based interventions, particularly in traditionally underserved populations. Given the ability of Web-based resources to overcome barriers to mental health services particularly prevalent in this population, understanding mechanisms of improved access to such resources will be of increasing importance as future dissemination and implementation initiatives are pursued.

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