Impact of Telemedicine on Access to Care for Rural Transgender and Gender Diverse Youth

Pamela B. DeGuzman, PhD[1], Genevieve R. Lyons, MSPH[2], Francesca N. Azar, MSN[1], April Kimble, AD[3], Guoping Huang, DDes[4], Karen Rheuban, MD[5], and Susan H. Gray, MD[5]

Objective To explore the impact of telemedicine on access to gender-affirming care for rural transgender and gender diverse youth.

Study design A retrospective analysis of data drawn from the electronic medical records of a clinic that provides approximately 10 000 adolescent and young adult visits per year and serves patients seeking gender health care. The no-show rate was examined as a proxy for access to care due to anticipated challenges with recruiting a representative sample of a historically marginalized population. Logistic regression with generalized estimating equations was conducted to model the association between the odds of a no-show visit and covariates of interest.

Results Telemedicine visits, rural home address, gender health visits, longer travel time, and being younger than 18 years old were associated with lower odds of a no-show in univariate models (n = 17 928 visits). In the adjusted model, the OR of no-shows for gender health visits was 0.56 (95 CI 0.42-0.74), adjusting for rurality, telemedicine, age (< or >18 years), and travel time to the clinic.

onclusions In this study, telemedicine was associated with reduced no-shows overall, and especially for rural, transgender and gender diverse youth, and patients who hold both identities. Although the no-show rate does not fully capture barriers to access, these findings provide insight into how this vulnerable population may benefit from expanded access to telemedicine for rural individuals whose communities may lack providers with the skills to serve this population. *J Pediatr 2024;267:113911).*

outh in rural areas who are transgender and gender-diverse (TGD) are highly susceptible to negative health outcomes due to inequitable distribution of resources to serve this population. TGD youth have reported alarmingly high rates of depression (35%-58%),[1-4] suicidal ideation (30%-70.3%),[2,4-8] self-harm (15.4%-54.8%),[2,3,5,7,9] and suicide attempts (9.3%-31.0%).[1-5] These risks may be far elevated for TGD youth living in rural areas due to the lack of appropriate care in those regions, because this care is typically only available in urban areas.[10] Thus, rural TGD youth may be left either completely without a source of care or needing to commute hundreds of miles to receive appropriate care. Furthermore, despite the greater proportion of transgender persons living in the rural US,[11] rural TGD youth often have fewer social support systems due in part to the greater concentration of individuals in rural areas who may hold negative views toward gender diversity (such as those who are politically conservative and/or religious).[12] Providing equitable access for rural TGD youth is needed to help minimize negative health outcomes, and ensuring equitable access to gender-affirming care for TGD youth is critical to their physical and mental health.

Telemedicine has enormous potential to expand access to care for rural populations,[13-15] but it is not clear how this technology affects access for rural TGD youth. Telemedicine video visits simulate an in-person visit, allowing a patient and provider to hear and see each other in real time without the patient traveling to the site of care,[16] but US rural populations often lack a sufficiently strong internet signal to stream a video visit, leaving many unable to participate in telemedicine.[17] As such, the technology can improve access for those who live at long distances from care and have home-based broadband internet. However, for rural populations who lack home-based broadband internet, telemedicine can in fact worsen the digital health divide (ie, the difference in health between those who do and do not have access to the internet).[18,19] In this case, rural TGD youth without broadband still may either need to forgo a visit or travel many hours to receive appropriate care.

A lack of digital skills also has the potential to negatively affect rural TGD youth's technology use. Although it is widely accepted that younger people

AYA	Adolescent and young adult
COVID-19	Coronavirus disease 2019
EMR	Electronic medical record
GH	Gender health
TGD	Transgender and gender-diverse

From the [1]Department of Family, Community, and Mental Health Systems, University of Virginia School of Nursing, Charlottesville, VA; [2]Department of Public Health Sciences, University of Virginia School of Medicine, Charlottesville, VA; [3]Teen and Adolescent Health Center, UVA Health, Charlottesville, VA; [4]Spatial Sciences Institute, University of Southern California, Los Angeles, CA; and [5]Department of Pediatrics, University of Virginia School of Medicine, Charlottesville, VA

https://doi.org/10.1016/j.jpeds.2024.113911

may have greater familiarity with technology and stronger digital skills than older people,[20] adolescents and young adults (AYAs) may not have strong digital skills for accessing health care.[18] For example, digital natives (ie those who grew up using the internet) have significantly greater skills for game playing, sharing pictures and files, and using phones, than for sophisticated use of information and communication technologies.[21,22] It is not clear how rural or TGD youth use telemedicine to access appropriate and competent care. The purpose of this study was to explore the impact of telemedicine on access to care for rural TGD youth.

Methods

We used a retrospective quantitative design using secondary data to accomplish the study purpose. Measuring access to care for rural TGD youth is challenging for several reasons. First, it is difficult to recruit a representative sample of TGD youth because as members of a marginalized community, transgender individuals may view researchers as voyeuristic or insensitive, or experience research participation as overwhelming or alienating.[23,24] Those who reside in rural areas are particularly difficult to recruit,[25,26] likely explaining their minimal representation in health research. Thus, we chose a retrospective, secondary research design using data drawn from an electronic medical record (EMR) of an academic medical center with a clinic serving TGD AYA. The study was conducted with approval from the University of Virginia in Charlottesville, Virginia institutional review board where the work was conducted.

Measuring Access to Care

Visit appointment no-show rates provide unique insight into access to care. No-show rates are markedly high in adolescents—often approximately 15%-30%—[27-34] and thus provide a metric to compare between diverse groups to approximate the impact of telemedicine technology.

Setting

We extracted data from an AYA-specialized clinic associated with a large academic medical center and located in a small urban area surrounded by rural communities. Approximately one-third of the clinic's patients come from rural areas and many travel several hours to access care. The clinic predominately provides primary care but also has 2 specialty care areas: gender health (GH) and eating disorders. Before the coronavirus disease pandemic of 2019 (COVID-19), the clinic did not offer telemedicine visits and began offering this service in March 2020, with nearly exclusive use during March and April and eventually settling into a balance of in-person and telemedicine visits following the initial surge.

Variable Development

All variables were developed from data extracted from the EMR for visits between March 2020 and December 2021. The dataset included dates of visits, visit modality (telemedicine vs in-person), visit type (ie, GH, eating disorder, primary care), insurance status, address, and visit attendance, as well as demographic variables (date of birth, race, gender at birth, and preferred gender). Of note, the determination of whether a patient was GH-seeking involved several steps. First the visit type was determined through a several-step process in order to capture these distinct visit types as precisely as possible. The first step included identifying whether the appointment was classified as a GH or eating disorder visit when it was scheduled. For visits that still remained unclassified, we searched for post-visit notes or diagnosis codes that indicated a GH or eating-disorder visit. All visits of patients identified from any GH or eating disorder encounter were classified as GH or eating disorder (respectively), and all remaining visits were classified as primary care. Visit type was presented in descriptive statistics, but the final model compared TGD youth with cisgender youth for 2 reasons: first, because being transgender is an identity that affects all visits regardless of type, and second, because TGD or cisgender youth could have multiple visits of different types.

Anonymous address data were extracted and geocoded to develop several geospatial variables in order to capture the complex impact of rurality on visit attendance. Rurality was categorized using the US Census Bureau's dichotomous urban–rural delineation in which an urban area must encompass at least 2000 housing units or have a population of at least 5000 according to 2020 census data. In order to provide a more nuanced view of the impact of commuting long distances to care, we also calculated travel time from each patient's home address to the nearest clinic using the Generate Origin Destination Cost Matrix tool in the ArcGIS Desktop program (ArcGIS Release 10.8. Environmental Systems Research Institute). Because broadband typically is needed for a telemedicine visit (ie, to avoid cellular data charges) and is less available in rural areas, we developed a broadband access variable as the percent of households in each residential Census block group with home broadband, from the American Community Survey.[35]

Analysis

Sample characteristics and visit characteristics were summarized using descriptive statistics. Characteristics of interest were the proportion of telemedicine vs in-person encounters, attendance rates overall and by visit modality, urban/rural status, visit type (GH or other), and age (at least age 18 vs 17 and younger).

We used logistic regression with generalized estimating equations to model the association between the binary visit attendance variable and covariates of interest. Many patients had multiple visits, and because visit attendance may be influenced by the same circumstances, these observations cannot be treated as independent. Generalized estimating equations statistically account for within-patient correlation while estimating odds of no-show at the visit level. Univariate models were run, followed by selection of a parsimonious multivariable model, adjusting for relevant covariates.

Table I. Patient characteristics and visit characteristics of the study populations

Patient characteristics (n = 2908)		Visit characteristics (n = 17 928)	
Legal sex, No. ( )		Visit type, No. ( )	
Female	2327 (80.0)	GH	984 (5.5)
Male	579 (19.9)	Eating disorder	4597 (25.6)
Unknown	2 (0.1)	Primary care	12 347 (68.9)
Gender identity, No. ( )			
Female	2211 (76.0)	No-show? No. ( )	
Male	604 (20.8)	No-show	1953 (10.9)
Non-binary	39 (1.3)		
TGD female	16 (0.6)	Telemedicine, No. ( )	
TGD male	38 (1.3)	Yes	4917 (27.4)
Race, No. ( )			
White	1694 (58.3)	Rurality, No. ( )	
Black	724 (24.9)	Rural	6410 (35.8)
Asian	68 (2.3)	Urban	11 483 (64.2)
Other	138 (4.8)		
Hispanic	284 (9.8)	Travel time, min, median (IQR)	23.6 (10.3; 48.6)
Age, y, median, (IQR)	17 (15; 17)		
Younger than 18? No. ( )			
Younger than 18	1523 (52.4)		
Number of visits, median (IQR)	3 (1; 7)		

Percentages may not add up to 100 due to rounding.

Two sensitivity analyses were conducted. First, we sought to determine whether results were stable over the study period or varied in the early days of the pandemic when health care was changing rapidly; for this, we conducted 2 analyses, excluding appointments scheduled before November 2020 and then for all of 2020. Second, we sought to investigate whether no-shows for patients with GH visits might be underestimated due to being classified incorrectly as primary care. For this analysis, we modeled odds of no-show for telemedicine visits in a subset of data that included only eating disorder visits. Because approximately 6% of patients with GH visits also sometimes scheduled eating disorder visits, the comparison is not perfect; however, it gave insight into how underestimated our results might be.

Results

Our data included 17 928 encounters from March 2020 to December 2021, made by 2908 unique individuals. Table I presents descriptive characteristics of the visits and individuals. The majority of patients (80%) indicated their legal sex was female, whereas 76% indicated a female gender identity. Approximately 20.7% listed a male gender identity and the remaining 3.2% were divided between transgender and those listed as "other" in the EMR. Other was likely selected because the EMR did not capture nonbinary information during the study period, so for the purpose of this study we are listing it as "nonbinary." The majority of patients (58.3%) were White, 24.9% were Black, 9.8% were Hispanic, and fewer than 5% were Asian or listed another race.

During the study period, 27.4% of visits were conducted via telemedicine. Of note, before the study period, the clinic did not use telemedicine for any visits. For 35.8% of encounters, the patient listed a rural home address. Approximately 5.5% of the visits were classified as GH, 25.6% were eating disorder visits, and the remainder (68.9%) were primary care.

The Figure presents unadjusted rates of no-show visits for various visit types. Overall, 10.9% of visits were no-show, but this proportion differed across visit types. Visits via telemedicine had a no-show rate of only 5.4%. Across the board, GH visits had lower no-show rates than non-GH visits. Among GH visits, only 6.5% were no-show compared with 11.1% for non-GH visits, and among visits made by rural patients, 8.7% were no-show, vs 12.2% for non-rural patients. Among non-GH encounters, rural patients had a no-show rate of 9.1% and urban patients had a no-show rate of 12.8%, whereas for GH encounters, we observed that rural and urban patients had comparable no-show rates at 5.9% and 6.3% respectively. Youth who were younger than the age of 18 years had an overall no-show rate of about 8.6%, whereas patients aged 18 and older had a no-show rate of approximately 13.8%. Patients with GH visits who were minors had a no-show rate of 5.3%, whereas for patients without GH visits, it was 8.9%. Patients with GH visits who were adults had a no-show rate of 7.2%, whereas for without GH visits, it was 14.6%. These results also were observed in univariable models accounting for repeat visits made by the same patient. GH, rural, and telemedicine visits were associated with reduced odds of no-shows. Travel time also was associated with reduced odds of no-show such that the farther away a patient lived, the less likely they were to no-show.

Table II presents the results of the multivariable model evaluating the association between telemedicine vs in-person visit and odds-of no-show, adjusted for relevant covariates including being a patient with a GH visit, rurality, age younger than 18 years, and travel time to the clinic. Of note, broadband access was not included in the

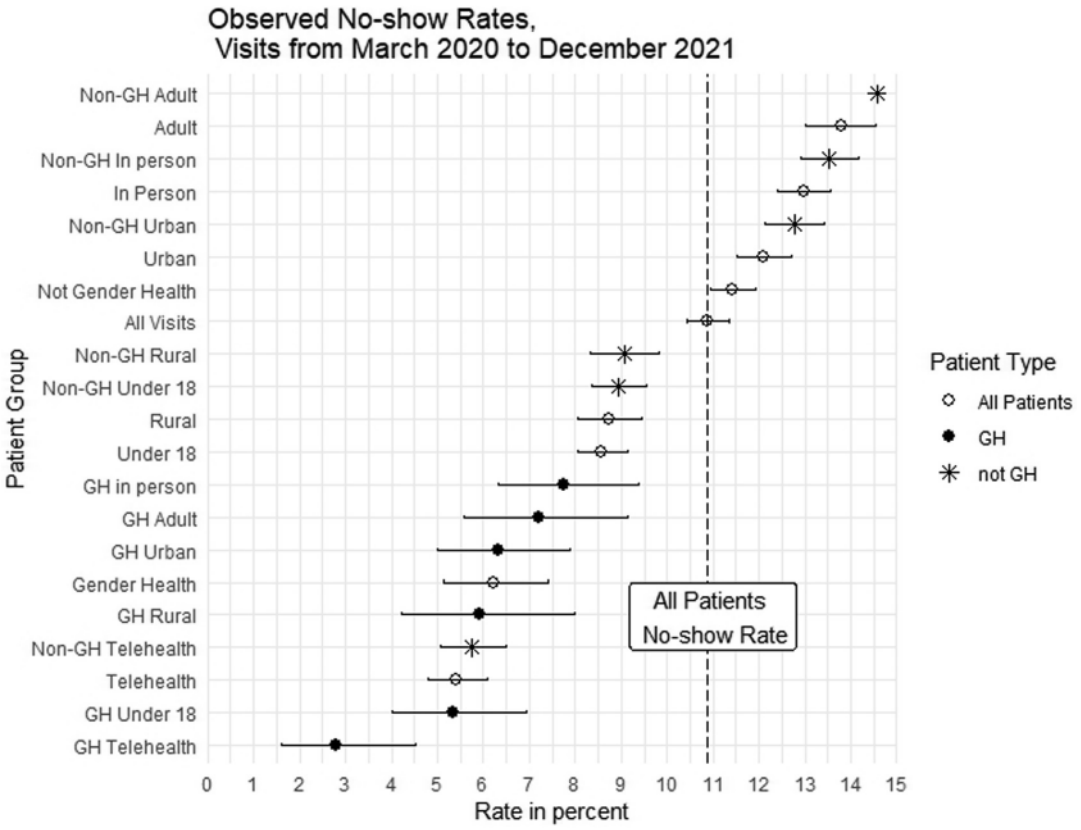

Figure Observed, unadjusted no-show rates for all patients March 2020 through December 2021. Rates are shown separately for patients with GH visits and patients without GH visits, then further split into subgroups for age group (adult and younger than 18 years old), telemedicine and in-person, and rural and urban. The rates are reported in descending order for ease of visualization. The *vertical line* indicates the no-show rate for all patients.

final model because, although it did have a significant impact on no-show rates, the effect size was sufficiently small to be determined inconsequential by the study team. The aOR (95% CI) of no-show for telemedicine visits was 0.44 (0.36-0.54), which corresponds to a 56% reduction in odds of no-show. For GH visits, the aOR was 0.56 (0.42-0.74), which corresponds to a 44% reduction in odds of no-show compared with patients without a GH visit, when adjusting for rurality, whether it is a telemedicine visit, whether they are 18 years old or older, and travel time from their address to the clinic.

The sensitivity analysis considering time frame found that odds of no-show remained stable across the study period, and the early pandemic months did not influence our results (not shown). In the analysis that considered eating disorder visits only, we observed that the odds of no-show (95% CI) for telemedicine visits among eating disorder visits only was 0.64 (0.48-0.84). This corresponds to a somewhat-smaller reduction in odds of no-show compared with the overall model (0.44, above).

Table II. Adjusted model for odds of no show

Characteristics	OR estimate	95 CI	value
GH patient vs not GH patient	0.56	(0.42-0.74)	<.0001
Rural patient vs urban patient	0.80	(0.69-0.94)	.0052
Telemedicine vs in-person visit	0.44	(0.36-0.54)	<.0001
18 or older vs younger than 18	1.46	(1.27-1.69)	<.0001
Travel time, per additional 10 min	0.95	(0.93-0.97)	<.0001

Discussion

Our results suggest that telemedicine is associated with improved access to care, especially for rural TGD youth. Findings are consistent with previous research that has found improved access among both transgender adults[36] and rural patients[37] who use telemedicine.

The association between telemedicine use and access to care for rural TGD youth has not been thoroughly examined. Within the context of limited pediatric specialists practicing in rural areas, combined with the lack of rural providers trained in gender-affirming care,[38,39] broadening telemedicine access in rural areas has the potential to improve the health trajectory of AYAs seeking gender-affirming care. Our findings may be applicable to other AYA populations, as our results demonstrated that telemedicine is associated

with improved visit attendance for the general AYA population, a finding that is supported by an earlier study of an adolescent specialty care clinic that rapidly implemented telemedicine during COVID-19.[40] In particular, and because of the pandemic, we were able to examine no-show rates when a sizable portion of visits are held by telemedicine, further verifying that offering telemedicine visits to patients who were AYA can reduce the no-show rate.

Our study further revealed that AYAs in rural areas are less likely to no-show for visits for gender-affirming care than either patients in nonrural who were AYA seeking gender-affirming care or rural patients who were AYA seeking other types of care. This novel finding suggests that TGD youth highly value appropriate and competent care once they are able to find it and that rural TGD may value it even greater than those living in nonrural areas.

These results have important implications for understanding how AYAs access gender-related medical and supportive care. Availability of gender-affirming care is the third most-common barrier to care for individuals who are TGD, which can include a lack of providers who are not only willing to provide care, but also those competent in TGD care delivery.[41] Taken together with the telemedicine analysis, these results strongly suggest that offering telemedicine to TGD youth has the impact to significantly improve access to appropriate and competent care for those living in provider-shortage areas.

We were surprised that access to home-based broadband had little effect on no-shows. After discussion with AYA providers, we learned that during the height of the pandemic, their patients were using mobile wireless hotspots to access telemedicine, which were provided through school districts to facilitate virtual school during this time.[42] Although the immediate urgency of school closings had passed by the end of the study period, public libraries around the countries also recognized the difficulty that patients in rural areas have had connecting to telemedicine, and have begun to open their doors to allow the public to connect to providers in one of their specially designed private spaces.[43] Ultimately, because our broadband variable did not capture mobile hotspots or other novel connection locations, we excluded the broadband coverage variable from models, as it was an unreliable measure of access to high-speed internet.

Our study is limited in its assessment of access by using the no-show rate as the outcome of interest. This variable fails to account for the patients who did not make an appointment due to other barriers to access, which may include lack of parental support, or knowledge of the clinic and the services provided, and only captures the ability to attend a scheduled appointment. A further caveat to our findings is that the no-show rate for patients seeking primary care may be overestimated relative to GH and eating disorder patients. Because we categorized visits based on data available in the medical record, some GH and eating disorder no-show visits may have been missed. For example, if a patient did not show up for an appointment, and the original appointment scheduler did not indicate that it was a GH visit, we may have inappropriately categorized it as a non-GH, no-show. Our sensitivity analysis of eating disorder visits resulted in somewhat-smaller reduction in odds of no-show for telemedicine visits than in the full sample. This difference could be related to underestimation of GH no-shows due to misattributing them to primary care, but it is not a drastic difference, and it remains consistent with our observation that these patients are significantly less likely to no-show for telemedicine visits than in-person visits.

Because of the potential for undercounting no-show visits, we stopped short of comparing our no-show rates with no-show rates associated with adolescents in other studies. This study reflects the context of the early COVID-19 pandemic phase and may not be generalizable in the sense that enthusiasm for telemedicine services may now be somewhat less.

In conclusion, telemedicine greatly enhances access to care, and visit nonattendance rates are decreased for visits offered via telemedicine. This phenomenon is more pronounced for AYA seeking gender-affirming care, patients from rural areas, and especially the overlap between these 2 groups. Clinics that serve TGD youth may be able to improve their reach into rural settings by offering or expanding telemedicine care. One implication for policy is that with the sunsetting of the public health emergency, decreased reimbursement for telemedicine services may have the effect of limiting access to care for vulnerable rural populations. The provision of broadband hotspots to promote school attendance may have played a protective health role because, in this study, broadband access did not appear to impact the ability of AYA living in rural areas to attend a telemedicine visit.

CRediT Authorship Contribution Statement

Pamela B. DeGuzman: Writing – review & editing, Writing – original draft, Supervision, Project administration, Investigation, Funding acquisition, Conceptualization. **Genevieve R. Lyons:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis. **Francesca N. Azar:** Writing – review & editing, Writing – original draft, Funding acquisition, Conceptualization. **April Kimble:** Writing – review & editing, Conceptualization. **Guoping Huang:** Writing – review & editing, Writing – original draft, Formal analysis. **Karen Rheuban:** Writing – review & editing, Resources, Data curation. **Susan H. Gray:** Writing – review & editing, Writing – original draft, Resources, Data curation, Conceptualization.

Declaration of ompeting Interest

This research was supported by a grant from the Daisy Foundation. K.R. holds an advisory board role with TytoCare. All other authors have no conflicts of interest to declare.

Submitted for publication Sep 6, 2023; last revision received Jan 4, 2024; accepted Jan 9, 2024.

Reprint requests: Pamela B. DeGuzman, PhD, University of Virginia School of Nursing, PO Box 800788, Charlottesville, VA 22908. E-mail: deguzman@virginia.edu

References

1. Olson J, Schrager SM, Belzer M, Simons LK, Clark LF. Baseline physiologic and psychosocial characteristics of transgender youth seeking care for gender dysphoria. J Adolesc Health 2015;57:374-80.
2. Eisenberg ME, Gower AL, McMorris BJ, Rider GN, Shea G, Coleman E. Risk and protective factors in the lives of transgender/gender nonconforming adolescents. J Adolesc Health 2017;61:521-6.
3. Spack NP, Edwards-Leeper L, Feldman HA, Leibowitz S, Mandel F, Diamond DA, et al. Children and adolescents with gender identity disorder referred to a pediatric medical center. Pediatrics 2012;129:418-25.
4. Newcomb ME, Hill R, Buehler K, Ryan DT, Whitton SW, Mustanski B. High burden of mental health problems, substance use, violence, and related psychosocial factors in transgender, non-binary, and gender diverse youth and young adults. Arch Sex Behav 2020;49:645-59.
5. Reisner SL, Vetters R, Leclerc M, Zaslow S, Wolfrum S, Shumer D, et al. Mental health of transgender youth in care at an adolescent urban community health center: a matched retrospective cohort study. J Adolesc Health 2015;56:274-9.
6. Perez-Brumer A, Day JK, Russell ST, Hatzenbuehler ML. Prevalence and correlates of suicidal ideation among transgender youth in California: findings from a representative, population-based sample of high school students. J Am Acad Child Adolesc Psychiatry 2017;56:739-46.
7. Liu RT, Mustanski B. Suicidal ideation and self-harm in lesbian, gay, bisexual, and transgender youth. Am J Prev Med 2012;42:221-8.
8. Aparicio-García ME, Díaz-Ramiro EM, Rubio-Valdehita S, López-Núnez MI, García-Nieto I. Health and well-being of cisgender, transgender and non-binary young people. Int J Environ Res Public Health 2018;15:2133.
9. Chen M, Fuqua J, Eugster EA. Characteristics of referrals for gender dysphoria over a 13-year period. J Adolesc Health 2016;58:369-71.
10. Hsieh S, Leininger J. Resource list: clinical care programs for gender-nonconforming children and adolescents. Pediatr Ann 2014;43:238-44. https://doi.org/10.3928/00904481-20140522-11
11. Crissman HP, Berger MB, Graham LF, Dalton VK. Transgender demographics: a household probability sample of US adults, 2014. Am J Public Health 2017;107:213-5. https://doi.org/10.2105/AJPH.2016.303571
12. Poquiz J, Moser CN, Grimstad F, Boman K, Sonneville SA, Turpin A, et al. Gender-affirming care in the Midwest: reaching rural populations. J Rural Mental Health 2021;45:121-8. https://doi.org/10.1037/rmh0000174
13. Zahnd W, Ganai S. Access to cancer care in rural populations: barriers and solutions. ASCO Daily. 2019. Accessed July 31, 2020. https://dailynews.ascopubs.org/do/10.1200/ADN.19.190161/full/
14. Doolittle GC, Spaulding AO. Providing access to oncology care for rural patients via telemedicine. J Oncol Pract 2006;2:228-30. https://doi.org/10.1200/jop.2006.2.5.228
15. Fairchild RM, Laws S, Rahmouni H, Hardesty D. Telehealth decreases rural emergency department wait times for behavioral health patients in a group of critical access hospitals. Telemed J E Health 2018;00:1-11. https://doi.org/10.1089/tmj.2018.0227
16. Rheuban KS, Shipman S. Workforce, definitions, and models. In: Rheuban KS, Krupinski EA, eds. Understanding telehealth. New York (NY): McGraw-Hill Education; 2018.
17. Federal Communications Commission. 2016 Broadband progress report. Report FCC 16-6. Washington (DC). 2016. Accessed October 6, 2019. https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2016-broadband-progress-report :~:text=Key%20findings%20include%20the%20following,25%20Mbps%2F3%20Mbps%20broadband
18. DeGuzman PB, Bernacchi V, Cupp CA, Dunn B, Ghamandi BJF, Hinton ID, et al. Beyond broadband: digital inclusion as a driver of inequities in access to rural cancer care. J Cancer Surviv 2020;14:643-52. https://doi.org/10.1007/s11764-020-00874-y
19. DeGuzman PB, Jain N, Loureiro CG. Public libraries as partners in telemedicine delivery: a review and research agenda. Publ Libr Q 2021;41:1-12. https://doi.org/10.1080/01616846.2021.1877080
20. Levy H, Janke AT, Langa KM. Health literacy and the digital divide among older Americans. J Gen Intern Med 2015;30:284-9. https://doi.org/10.1007/s11606-014-3069-5
21. Ståhl T. How ICT savvy are digital natives actually? Nordic J Digital Literacy 2017;12:89-108. https://doi.org/10.18261/ISSN.1891-943X-2017-03-04
22. Correa T. Digital skills and social media use: how internet skills are related to different types of Facebook use among 'digital natives.' Inf Commun Soc 2016;19:1095-107. https://doi.org/10.1080/1369118X.2015.1084023
23. Harrison J, Grant J, Herman JL. A gender not listed here: genderqueers, gender rebels, and otherwise in the National Transgender Discrimination Survey. LGBTQ 2012;2:13-24.
24. Vincent BW. Studying trans: recommendations for ethical recruitment and collaboration with transgender participants in academic research. Psychol Sex 2018;9:102-16. https://doi.org/10.1080/19419899.2018.1434558
25. Loftin WA, Barnett SK, Bunn PS, Sullivan P. Recruitment and retention of rural African Americans in diabetes research: lessons learned. Diabetes Educat 2005;31:251-9. https://doi.org/10.1177/0145721705275517
26. McCrone SH. Recruitment and retention of rural women into research protocols: Lessons learned. Hawaii's Big Island: 16th International Nursing Research Congress; 2005. Accessed July 14, 2005. https://stti.confex.com/stti/inrc16/techprogram/paper_22788.htm
27. Chaudhry SB, Siegfried E, Sheikh UA, Simonetta C, Butala N, Armbrecht E. Improving nonattendance rates among pediatric patients with Medicaid or private insurance. J Am Acad Dermatol 2019;81:412-6.
28. Brown DN, Shields BE, Shrivastava S, Welsh K, Mir A, Wan J, et al. A cross-sectional study of no-show rates and factors contributing to nonattendance at 3 academic pediatric dermatology centers in the United States. J Am Acad Dermatol 2021;86:1169-72.
29. Fiorillo CE, Hughes AL, I-Chen C, Westgate PM, Gal TJ, Bush ML, et al. Factors associated with patient no-show rates in an academic otolaryngology practice. Laryngoscope 2018;128:626-31.
30. Snodgrass A, Schoch JJ. The impact of personalized reminders in addition to an automated patient reminder system on pediatric dermatology no-show rates: a pilot study. Pediatr Dermatol 2019;36:741-2.
31. van Houten L, Deegan K, Siemer M, Walsh S. A telehealth initiative to decrease no-show rates in a pediatric asthma mobile clinic. J Pediatr Nurs 2021;59:143-50.
32. Guzek LM, Gentry SD, Golomb MR. The estimated cost of "no-shows" in an academic pediatric neurology clinic. Pediatr Neurol 2015;52:198-201.
33. Markowitz JT, Volkening LK, Laffel LMB. Care utilization in a pediatric diabetes clinic: cancellations, parental attendance, and mental health appointments. J Pediatr 2014;164:1384-9.
34. Knight J, Hammett P. Using the six sigma methodology to reduce missed appointments at a pediatric inner-city clinic. J Ambul Care Manag 2021;44:46-55.
35. United States Census Bureau. 2015-2019 American Community Survey 5-year estimates, Table S2801. 2020. Accessed May 23, 2023. https://www.census.gov/programs-surveys/acs/technical-documentation/table-and-geography-changes/2019/5-year.html
36. Gava G, Fisher AD, Alvisi S, Mancini I, Franceschelli A, Seracchioli R, et al. Mental health and endocrine telemedicine consultations in transgender subjects during the COVID-19 outbreak in Italy: a cross-sectional web-based survey. J Sex Med 2021;18:900-7. https://doi.org/10.1016/j.jsxm.2021.03.009
37. Creedon TB, Schrader KE, O'Brien PL, Lin JR, Carroll CD, Mulvaney-Day N. Rural-nonrural differences in telemedicine use for mental and substance use disorders among Medicaid beneficiaries. Psychiatr Serv 2020;71:756-64. https://doi.org/10.1176/appi.ps.201900444
38. Reisner SL, Benyishay M, Stott B, Vedilago V, Almazan A, Keuroghlian AS. Gender-affirming mental health care access and utilization among rural transgender and gender diverse adults in five Northeastern U.S. states. Transgend Health 2022;7:219-29. https://doi.org/10.1089/trgh.2021.0010
39. Mayer ML, Skinner AC, Slifkin RT, National Survey of Children With Special Health Care Needs. Unmet need for routine and specialty care:

data from the National Survey of Children With Special Health Care Needs. Pediatrics 2004;113:e109-15.
40. Wood SM, White K, Peebles R, Pickel J, Alausa M, Mehringer J, et al. Outcomes of a rapid adolescent telehealth scale-up during the COVID-19 pandemic. J Adolesc Health 2020;67:172-8. https://doi.org/10.1016/j.jadohealth.2020.05.025
41. Puckett JA, Cleary P, Rossman K, Mustanski B, Newcomb ME. Barriers to gender-affirming care for transgender and gender nonconforming individuals. Sex Res Soc Pol 2018;15:48-59. https://doi.org/10.1007/s13178-017-0295-8
42. Riley T. Locally owned rural telcos establish hotspots to meet demand during pandemic. Daily Yonder. Accessed April 22, 2020. https://dailyyonder.com/locally-owned-rural-telcos-establish-hotspots-to-meet-demand-during-pandemic/2020/04/22/
43. DeGuzman PB, Jain N, Aziz H, Martin N. Telemedicine in public libraries: innovation among early adopters. In Press at Library Quarterly; 2022.