

<https://doi.org/10.1038/s44184-025-00183-1>

Telemedicine disparities among adolescents with suicidal thoughts and behaviors during the COVID-19 pandemic



Morgan J. Grant^{1,2}✉, Heath Hightower³ & Tamika D. Gilreath^{1,2}

Telemedicine became a vital tool during the COVID-19 pandemic, a time marked by increased social isolation and mental health challenges among adolescents. Using data from 7,998 U.S. adolescents collected in early 2021 via the Adolescent Behavior Experience Survey, this study examined intersectional disparities in telemental health use. Stratified multivariable logistic regression models revealed significantly lower odds of telemedicine use for mental health care among marginalized groups who experienced suicidal thoughts or behaviors. These included Black, Hispanic/Latino, and multi-racial Latino female adolescents; Black heterosexual adolescents; and sexual minority multi-racial non-Latino adolescents. Notably, sexual minority multi-racial non-Latino adolescents showed higher odds of telemental health care use in some cases. The findings highlight critical gaps in access and underscore the need for targeted strategies to improve equitable mental health service delivery, particularly for racially diverse sexual and gender minority youth navigating intersecting structural and identity-based inequities.

The COVID-19 pandemic profoundly disrupted the lives of adolescents worldwide, intensifying risks for depression, anxiety, and suicidal thoughts and behaviors. Stressors such as prolonged social isolation¹, altered daily routines^{2,3}, financial instability⁴, and health and health-related fears and concerns^{5,6} amplified pre-existing vulnerabilities and created new barriers to well-being. Moreover, these stressors both elevated risks of and compounded harms related to anxiety, depression, and suicide⁷. This confluence of a viral pandemic, psychosocial stress, and heightened mental health concerns posed - and continues to pose - challenges for U.S. medical and mental health service delivery. Such challenges pose unique harms across various sex, and sexual and gender minority (SGM) cohorts. Batra et al. observed, “Increased vulnerability to mental health concerns, combined with unmet mental health needs and a lack of culturally competent care, is a critical context for examining impacts of the COVID-19 on the mental health of SGM people”⁸. Furthermore, Prichett et al. noted that the youth who live at the intersections of multiple marginalized gender and racial identities and COVID-19 experienced heightened anxiety, depression, and suicide risk⁹. These researchers reported that Hispanic and Asian females experienced the greatest increase in depression and anxiety rates after the start of the pandemic. They also revealed that Asian females experienced the greatest increase in suicide-related diagnoses. Moreover, since the pandemic, SGM youth of color often experienced the compounding effects of

societal oppression and family rejection¹⁰. This research team underscored that such intersectional harms frequently contribute to identity concealment, anxiety, depression, substance use, and suicide risk. As a result of these unique harms and the pandemic and post-pandemic challenges faced by medical and mental healthcare systems, new service delivery platforms were - and still are - needed.

In response to the pandemic, telemedicine emerged as a vital tool for maintaining continuity of care when in-person services were disrupted. Early studies indicate that adolescents engaged with telehealth for both general medical and mental health services¹¹. However, access was inequitable. Structural barriers—including affordability, digital literacy, broadband access, and privacy—disproportionately affected low-income and marginalized households^{12–14}. Moreover, among LGBTQ+ youth, nearly half who desired mental health services during the pandemic could not access them, citing cost, stigma, or safety concerns. These disparities underscore the urgent need to examine whether adolescents most vulnerable to suicidality could equitably access telemedicine during the pandemic.

Despite extensive documentation of adolescent mental health burdens during COVID-19, significant gaps remain in understanding who actually accessed telemedicine. Previous studies largely focus on broad youth populations or on disparities within single identity groups (e.g., race or sexual identity). Few projects have investigated how intersectional identities

¹Department of Health Behavior, School of Public Health, Texas A&M University, College Station, TX, USA. ²Center for Health Equity and Evaluation Research, School of Public Health, Texas A&M University, College Station, TX, USA. ³Department of Social Work and Equitable Community Practice, University of Saint Joseph, West Hartford, CT, USA. ✉e-mail: mjgrant@tamu.edu

—the combination of race/ethnicity, sex, sexual identity, and etc.—shape telemedicine uptake among adolescents with suicidal thoughts and behaviors. This omission limits the ability of public health and clinical systems to design equitable interventions. To our knowledge, no nationally representative study has systematically examined intersectional differences in telemedicine use among adolescents endorsing suicidality. Such an oversight necessitates research projects grounded in intersectionality and Social Determinants of Health conceptual frameworks.

Intersectionality provides a crucial lens for this study because marginalized identities do not operate in isolation; rather, they interact to create unique experiences of context-specific vulnerability or resilience¹⁵. For example, a Black bisexual female adolescent may face compounded barriers related to racism, sexism, and heterosexism that are not captured by examining any single identity category alone. Intersectional analysis therefore allows us to uncover disparities that would remain invisible in additive models. In the context of telemedicine utilization, applying intersectionality helps clarify why certain subgroups—such as racial/ethnic minority SGM youth—may experience disproportionately limited access to care despite broad availability of services. By recognizing these intersecting dynamics, the study can illuminate nuanced inequities in health care delivery for adolescents experiencing suicidality¹⁵. This recognition is enhanced by additional models that reveal the ways multiple identities shape lived experiences in structural contexts.

The social determinants of health (SDH) framework emphasizes that health outcomes are shaped by the conditions in which individuals live, work, and access health care with conditions grouped in five key domains as defined by Healthy People 2023¹⁶. Economic stability refers to factors such as employment, income, and financial security that influence access to basic resources. Education access and quality captures both educational attainment and the quality of learning environments, which affect health literacy, employment opportunities, and lifelong health trajectories. Health care access and quality address the availability of services, health insurance coverage, and the quality of care received. Neighborhood and built environment focuses on the physical conditions of communities, including housing, transportation safety, and environmental exposures. Finally, social and community context encompasses the impact of relationships, social support, civic participation and experiences with discrimination.

The SDH framework further strengthens the conceptual grounding of this study because it emphasizes how structural conditions—including poverty, food insecurity, digital divides, and parental abuse—shape adolescents' ability to access health care. For example, SGM youth are disproportionately impacted by adverse SDH, including poverty, lack of access to education, and discriminatory policies^{17,18}. Economic constraints pose a significant barrier to telemedicine utilization; for instance, 42% of LGBTQ+ youth reported that affordability prevented them from accessing mental health care, underscoring the link between economic inequality and limited health care access¹⁹. Health literacy, specifically digital health literacy, also plays pivotal roles in telemedicine access and utilization^{13,20}. However, SGM particularly those who face structural barriers (e.g., discrimination) and systemic barriers (e.g., isolation, stigma, low parental support) that contribute to low educational attainment, may be at heightened risk of limited health and digital health literacy, which in turn limits their ability to benefit from telemedicine services^{12,14,21,22}.

In concert, intersectionality and SDH position this study to advance understanding in unique ways. Intersectionality allows us to identify compounded risks among adolescents holding multiple marginalized identities, while SDH grounds these disparities in broader structural contexts such as economic hardship and digital exclusion. Using these frameworks in tandem enables a more comprehensive analysis of how identity-based inequities and structural determinants converge to shape telemedicine utilization. This integrative approach provides an essential framework for designing more equitable telehealth interventions that are responsive to the needs of adolescents most at risk of suicidality.

Accordingly, this study addresses a critical gap by using nationally representative data from the Adolescent Behaviors and Experiences Survey

(ABES) to examine disparities in telemedicine and telemental health utilization among adolescents with suicidal thoughts and behaviors during the COVID-19 pandemic. By illuminating patterns of inequity across intersecting identities and social determinants, our findings aim to inform the design of more equitable and affirming telehealth services.

This study investigates intersectional differences in telemedicine use among subpopulations of youth in the United States during the COVID-19 pandemic. We specifically examine 1) how telemedicine utilization differs among adolescents with suicidal thoughts and behaviors across racial/ethnic, sex, and sexual identity groups and 2) how social determinants of health (e.g., food insecurity, parental abuse, digital connectedness, job loss) relate to telemedicine utilization in this population. We hypothesized that adolescents holding multiple marginalized identities (e.g., racial/ethnic minority SGM youth) will have significantly lower odds of telemedicine utilization compared to White, heterosexual peers. Additionally, we hypothesize that adverse SDH (e.g., food insecurity, parental abuse, economic hardship) will be associated with lower odds of telemedicine use, while affirming SDH (e.g., virtual connectedness) will be associated with higher odds. By employing the SDH framework in examining stratified models, the research aims to illuminate access gaps and propose strategies for equitable and effective health care delivery to marginalized populations, especially racially diverse SGM youths who live at the intersections of multiple identity-based inequities.

Methods

Data for this study come from the 2021 cycle of the Adolescent Behaviors and Experiences Survey (ABES), which assesses student behaviors and experiences during the COVID-19 pandemic among high school students, including unintentional injury, violence, tobacco product use, sexual behaviors, and dietary behaviors in the United States^{23,24}. The ABES was a one-time, online survey conducted during January–June 2021 and is a nationally representative sample of students in grades 9–12 attending 128 public and private schools²³. For the 2021 cycle, a total of 7,998 students submitted surveys and 7,705 of these surveys had valid data. The school response rate was 38%, the student response rate was 48%, and the overall response rate was 18%²³. This study was conducted in compliance with the Declaration of Helsinki. Ethical approval and informed consent were not required as the analysis used secondary data collected by the CDC. The ABES dataset was fully anonymized prior to access and no personable identifiable information was provided.

Telemedicine utilization was assessed by affirmative responses to the following questions: 1) “During the COVID-19 pandemic, did you get medical care from a doctor or nurse using a computer, phone, or other device?” and 2) “During the COVID-19 pandemic, did you get mental health care, including treatment or counseling for your use of alcohol or drugs, using a computer, phone, or other device?” Responses to these questions were dichotomized as “yes” or “no.” Missing data for each outcome was 8.3% and 8.9%, respectively

Independent variables were selected according to the SDH Framework, which categorizes determinants into domains such as Economic Stability, Education Access & Quality, Health Care Access & Quality, Neighborhood & Built Environment, and Social & Community Context²⁵. In this study, we included indicators from each relevant domain: Economic Stability (job loss, food insecurity), Education Access & Quality (schoolwork difficulty), Health Care Access & Quality (suicidal thoughts and behaviors, substance use, pandemic mental health) Neighborhood & Built Environment, and Social & Community Context (connectedness, parental abuse). Missing data for independent variables included in this study ranged from 0.6% to 12.6%.

Demographics

Key demographic variables included in this study were race (American Indian or Alaskan Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, White, Hispanic/LatinX, Multiracial Hispanic, Multiracial non-Hispanic), sex (female or male), and sexual identity (heterosexual, gay or lesbian, bisexual, some other identity,

questioning identity). Models were stratified by sex and sexual identity as described below.

Job loss

Participants indicated 1) if a parent or other adult in their home lost their job during the COVID-19 pandemic and 2) if they experienced student job loss during the COVID-19 pandemic.

Pandemic mental health

Participants indicated how often their mental health was not good during the COVID-19 pandemic (never, rarely, sometimes, most of the time, always).

Food insecurity

Participants disclosed how often they went hungry because there was not enough food in your home during the COVID-19 pandemic (never, rarely, sometimes, most of the time, always).

Schoolwork difficulty

Participants expressed their level of agreement that doing their schoolwork was more difficult during the COVID-19 pandemic than before (strongly agree, agree, not sure, disagree, strongly disagree).

Parental abuse

Physical abuse was assessed by expressing how often did a parent or other adult in their home hit, beat, kick, or physically hurt them in any way (never, rarely, sometimes, most of the time, always). Participants also disclosed how often a parent or other adult in their home swore at them, insulted them, or put them down (never, rarely, sometimes, most of the time, always).

Substance use

Participants expressed their level of agreement that they drank alcohol and used drugs more during the COVID-19 pandemic than before it started (strongly agree, agree, not sure, disagree, strongly disagree).

Connectedness

Participants disclosed how often they were able to spend time with family, friends, and other groups using a computer, phone, or other device (strongly agree, agree, not sure, disagree, strongly disagree).

Suicidal thoughts and behaviors

Participants were asked about their recent history of suicidal thoughts: “During the past 12 months, did you ever seriously consider attempting suicide?” (yes, no); “During the past 12 months, did you make a plan about how you would attempt suicide?” (yes, no); and “During the past 12 months, how many times did you actually attempt suicide?” (0 times, 1 time, 2 or 3 times, 4 or 5 times, 6 or more times).

All demographic variables were employed to describe and summarize the features of the ABES dataset as it pertains to the study population. Bivariate analyses were conducted to assess associations between independent variables and telemedicine utilization outcomes. Logistic regression analysis with a binary outcome for telemedicine and telemental health use was employed to investigate the relationship between discrete responses and explanatory variables (measures) among sample survey data using the *surveylogistic* procedure in SAS. This procedure is designed to analyze complex survey data and its features of stratification, multi-stage cluster sampling, probability sampling weights, and poststratification²⁶. To account for non-response and sample selection probabilities, sample weights, primary sampling units, stratum and cluster variables were included in the dataset to account for complex survey design. All analyses were conducted using SAS 9.4.

The domain analysis option was utilized for the analysis of stratified models by suicidal thoughts and behaviors with further stratification separately by sex and sexual identity as the subpopulations of interest. This resulted in twenty-four models assessing intersectional utilization of

telemedicine and telemental health services among adolescents. All other independent variables were entered simultaneously in the models.

Results

Demographics

Our study sample included data from 7705 adolescents in 9th–12th grades. Much of our sample were aged 15 years old (24.4%), female (50.4%), and in ninth grade (26.6%). Non-Hispanic White adolescents (49.8%) were the largest demographic by race/ethnicity followed by non-Hispanic Black (12.9%) and multi-racial Hispanic (17.4%). By sexual identity, heterosexual adolescents accounted for 76.1% of the sample, followed by gay or lesbian (13.0%). Additional demographic details are depicted in Table 1.

Telemedicine utilization regression analyses

Multivariable logistic regression results of telemedicine utilization in adolescents endorsing suicidal thoughts and behaviors are depicted by sex in Table 2 and gender identity in Table 3. Compared to White female adolescents, Black female adolescents who considered suicide had significantly reduced odds of telemedicine utilization (OR = 0.504; 95% CI: 0.279–0.910) whereas AI/AN/NHPI female adolescents who made a suicide plan (OR = 0.235; 95% CI: 0.093–0.591) or made an attempt (OR = 0.234; 95% CI: 0.077–0.715) had even lower odds of telemedicine utilization. Female adolescents who made a suicide plan and reported that their mental health was good sometimes during the pandemic had nearly half the odds of telemedicine utilization (OR = 0.501; 95% CI: 0.264–0.954) than those whose mental health was good most of the time during the pandemic. Differences in drug use were revealed: males who reported having considered suicide (OR = 2.585; 95% CI: 1.349–4.954 vs OR = 1.926; 95% CI: 1.250–2.968) and have made a suicide plan (OR = 2.237; 95% CI: 1.122–4.458 vs OR = 1.974; 95% CI: 1.180–3.301) had higher odds of telemedicine utilization than their female counterparts. Female adolescents who considered suicide and who reported being connected had significantly lower odds of telemedicine utilization than those who were not connected (OR = 0.564; 95% CI: 0.365–0.872).

Compared to White adolescents, multi-racial sexual minority adolescents who considered suicide (OR = 0.548; 95% CI: 0.328–0.914) and multi-racial non-Latino sexual minority adolescents who made a suicide plan (OR = 0.516; 95% CI: 0.266–0.999) were significantly at lower odds for telemedicine utilization. Similarly, sexual minority AI/AN/NHPI adolescents who made a suicide plan (OR = 0.137; 95% CI: 0.065–0.291) and made a suicide attempt (OR = 0.142; 95% CI: 0.039–0.514) had even significantly lower odds of telemedicine utilization. Sexual minority adolescents who had a suicide attempt and reported that their mental health was good sometimes during the pandemic had significantly lower odds of telemedicine utilization when compared to those whose mental health was good most of the time during the pandemic (OR = 0.223; 95% CI: 0.059–0.844). Sexual minority adolescents who considered suicide and experienced an increase in drug use during the pandemic had more than twice the odds of telemedicine utilization (OR = 2.327; 95% CI: 1.199–4.516); similarly, those who reported a suicide attempt had nearly twice the odds of telemedicine utilization (OR = 1.910; 95% CI: 1.027–3.554). For sexual minority adolescents who experienced virtual connectedness, those who considered suicide (OR = 0.64; 95% CI: 0.415–0.991) or made a suicide plan (OR = 0.632; 95% CI: 0.406–0.982) had significantly reduced odds of telemedicine utilization.

Telemental health care utilization regression analyses

Multivariable logistic regression results of telemental health care utilization in adolescents endorsing suicidal thoughts and behaviors are depicted by sex in Table 4 and gender identity in Table 5. By race/ethnicity, Black (OR = 0.485; 95% CI: 0.242–0.974), Hispanic/Latino (OR = 0.238; 95% CI: 0.069–0.814), and multi-racial Latino (OR = 0.361; 95% CI: 0.194–0.673) female adolescents who considered suicide had significantly lower odds of telemedicine utilization for mental health care than their White counterparts. Female adolescents who made a suicide plan and reported that their

Table 1 | Demographic characteristics among adolescents, 2021

Characteristics	Telemedicine Utilization		P value	Telemental health care Utilization		P value
	No	Yes		No	Yes	
Race/Ethnicity			0.0006			<0.0001
Am Indian/Alaska Native	58 (0.5)	18 (0.2)		71 (0.6)	5 (0.0)	
Asian	258 (3.8)	69 (1.3)		307 (4.9)	17 (0.2)	
Black or African American	822 (9.5)	217 (2.5)		963 (11.3)	72 (0.8)	
Native Hawaiian/Other PI	25 (0.5)	2 (0.0)		23 (0.4)	4 (0.1)	
White	2340 (36.1)	904 (14.6)		2899 (45.6)	326 (5.2)	
Hispanic/Latino	435 (6.3)	104 (1.5)		506 (7.4)	25 (0.3)	
Multiple - Hispanic	1011 (13.4)	312 (4.1)		1230 (16.4)	85 (1.1)	
Multiple - non-Hispanic	323 (4.0)	115 (1.7)		384 (4.8)	52 (0.9)	
Sex			<0.0001			<0.0001
Female	2664 (36.1)	1059 (15.3)		3348 (46.4)	355 (5.2)	
Male	2634 (38.0)	689 (10.5)		3073 (45.3)	225 (3.2)	
Sexual identity			0.0594			<0.0001
Bisexual	497 (6.9)	227 (3.1)		603 (8.2)	119 (1.8)	
Gay or lesbian	145 (2.2)	64 (0.9)		161 (2.4)	47 (0.7)	
Heterosexual	4037 (57.0)	1247 (19.0)		4936 (71.6)	314 (4.3)	
I do not know	130 (1.4)	28 (0.4)		147 (1.7)	7 (0.1)	
Not sure	279 (3.9)	114 (1.9)		344 (4.9)	50 (0.9)	
Some other way	173 (2.7)	59 (0.8)		188 (2.8)	43 (0.7)	
Parental job loss			0.0905			0.5683
No	3918 (54.2)	1230 (18.1)		4706 (66.4)	423 (6.0)	
Yes	1383 (19.9)	514 (7.7)		1711 (25.2)	163 (2.4)	
Student job loss			<0.0001			0.0004
No	4892 (68.3)	1555 (22.7)		5894 (83.8)	514 (7.3)	
Yes	412 (5.9)	191 (3.1)		526 (7.7)	73 (1.2)	
Mental health during pandemic not good			<0.0001			<0.0001
Always / Most of the time	2022 (27.5)	513 (7.5)		2412 (33.4)	97 (1.4)	
Never / Rarely	1820 (25.7)	781 (11.7)		2215 (32.2)	376 (5.2)	
Sometimes	1464 (21.0)	455 (6.7)		1794 (25.9)	115 (1.9)	
Food insecurity			0.7778			0.0004
No	4063 (56.6)	1329 (19.6)		4957 (70.6)	401 (5.7)	
Yes	1244 (17.6)	419 (6.2)		1466 (21.0)	185 (2.7)	
School work			0.2349			0.3014
No	1793 (25.2)	512 (8.3)		2115 (30.4)	170 (3.1)	
Yes	3516 (49.0)	1231 (17.5)		4306 (61.2)	416 (5.4)	
Parental emotional abuse			0.0003			<0.0001
No	2460 (34.7)	656 (10.0)		2954 (42.5)	151 (2.3)	
Yes	2831 (39.5)	1085 (15.8)		3449 (49.0)	436 (6.1)	
Parental physical abuse			0.1655			<0.0001
No	4676 (66.1)	1503 (22.6)		5688 (81.9)	453 (6.8)	
Yes	626 (8.1)	238 (3.2)		725 (9.6)	133 (1.6)	
Alcohol use			0.0012			<0.0001
No	4512 (64.1)	1418 (21.3)		5486 (79.2)	417 (6.2)	
Yes	731 (10.1)	300 (4.5)		862 (12.4)	163 (2.2)	
Drug use			<0.0001			<0.0001
No	4620 (66.5)	1413 (21.5)		5578 (81.5)	426 (6.4)	
Yes	609 (7.7)	295 (4.3)		748 (10.0)	154 (2.0)	
Connectedness			0.1009			0.1608
No	3710 (52.8)	1255 (19.1)		4536 (65.8)	405 (6.1)	
Yes	1571 (21.4)	483 (6.7)		1871 (25.7)	183 (2.5)	

Table 1 (continued) | Demographic characteristics among adolescents, 2021

Characteristics	Telemedicine Utilization		P value	Telemental health care Utilization		P value
	No	Yes		No	Yes	
Consider			0.0015			<0.0001
No	4313 (60.3)	1284 (19.5)		5250 (75.0)	303 (4.7)	
Yes	970 (13.8)	454 (6.4)		1146 (16.6)	279 (3.8)	
Plan			0.0198			<0.0001
No	4505 (63.4)	1380 (21.1)		5482 (78.9)	359 (5.5)	
Yes	767 (10.8)	353 (4.8)		899 (12.7)	222 (3.0)	
Attempt			<0.0001			<0.0001
No	4332 (68.3)	1353 (22.6)		5275 (84.7)	366 (6.1)	
Yes	373 (5.8)	202 (3.2)		429 (6.8)	151 (2.4)	

Boldface indicates statistical significance ($p < 0.05$).

mental health was good sometimes during the pandemic had lower odds of telemedicine utilization for mental health care (OR = 0.301; 95% CI: 0.140–0.646). Male adolescents who made a suicide plan and experienced difficulty with schoolwork had lower odds of telemedicine utilization for mental health care (OR = 0.376; 95% CI: 0.167–0.849). Male adolescents who made a suicide plan and experienced an increase in drug use during the pandemic had higher odds of utilizing mental health care telemedicine (OR = 3.196; 95% CI: 1.369–7.460).

For those who considered suicide, Black heterosexual adolescents (OR = 0.203; 95% CI: 0.070–0.590) and sexual minority multi-racial non-Latino adolescents (OR = 0.359; 95% CI: 0.204–0.631) had significantly lower odds of utilizing telemental health care. Sexual minority multi-race Latino adolescents who made a suicide plan (OR = 0.411; 95% CI: 0.210–0.803) and Black heterosexual students who made a suicide attempt (0.023; 95% CI: 0.005–0.116) had significantly lower odds of utilizing telemental health care, whereas sexual minority multi-racial non-Latino adolescents (OR = 2.915; 95% CI: 1.217–6.980) had significantly higher odds of utilizing telemental health care. Sexual minority adolescents whose mental health was not good sometimes during the pandemic and considered suicide (OR = 0.420; 95% CI: 0.186–0.946) had significantly lower odds of utilizing telemental health care, whereas heterosexual adolescents who made a suicide plan (OR = 0.299; 95% CI: 0.111–0.806) had even lower odds of utilizing telemental health care. Sexual minority adolescents who experienced job loss who have planned a suicide (OR = 3.206; 95% CI: 1.200–8.565) or made a suicide attempt (OR = 4.589; 95% CI: 1.492–14.111) had significantly higher odds of utilizing telemental health care. The odds for sexual minority adolescents with a history of suicide attempts that experienced parental emotional abuse were more than quadruple when compared to adolescents who did not experience emotional abuse (OR = 4.537; 95% CI: 1.069–19.264).

Discussion

This cross-sectional study explored differences in adolescent telemedicine utilization who experienced suicidal thoughts and behaviors during the COVID-19 pandemic. In doing so, we assessed associations by applying a SDH and intersectional lens to highlight differences in telemedicine utilization by suicidal thoughts and behaviors with sex and sexual and/or gender identity. Pre-pandemic studies have also revealed connections between adolescent employment and substance^{27–30}. Prior studies using ABES data have examined family economics and student mental health³¹, school and home life disruptions¹¹, and youth unemployment³². This study builds on these previous works by addressing a critical gap in understanding how adolescents experiencing suicidal thoughts and behaviors utilized telemedicine and telemental health care during the unprecedented shift to remote care brought by the COVID-pandemic. Our findings hold implications for clinical practice for addressing disparities in telemedicine utilization and mental health outcomes, particularly suicidal thoughts and behaviors while providing remote access to affirming care.

We found differences of telemedicine utilization by sex, particularly among female adolescents, Black and AI/AN/NHPI females adolescents, and male adolescents with drug use – all of whom endorsed suicidal thoughts and behaviors during the pandemic. By sex, there were also differences found among females that indicated low odds of telemental health care utilization, particularly in Black, Hispanic, and multi-racial Hispanic female adolescents. Additional differences were observed in females who endorsed suicide planning and with poor mental health during the pandemic. Sex differences play a critical role in shaping telemedicine access and utilization, particularly during the COVID-19 pandemic. Research^{33,34} has shown that males and females experience distinct barriers and facilitators to accessing telehealth services, influenced by biological, social, and structural determinants. Our findings are also consistent with research that have found While adolescents and female adolescents more commonly use telehealth services³⁵.

In contrast, males, particularly cisgender males, often report lower overall utilization of telemedicine. This lower usage is frequently attributed to societal norms that discourage males from seeking medical or mental health care, a phenomenon rooted in traditional constructs of masculinity. These norms may lead males to underutilize health services, including telemedicine, even when access barriers are low⁸. We found that in males who endorsed suicide planning, those who expressed difficulty with schoolwork had low odds of telemental health care utilization while the opposite was observed for those who experienced an increase in drug use. Traditional masculinity norms discourage emotional vulnerability, but drug use may signal distress in a way that is more socially “acceptable” for males. This could make intervention efforts more targeted toward those engaging in risky behaviors rather than those academically struggling. Males tend to externalize distress (e.g., substance use), while females are more likely to internalize (e.g., depression, anxiety)³⁶. As externalized behaviors often lead to disciplinary or health care interventions, it could be possible that male adolescents may have more pathways to telehealth.

We also found differences in general telemedicine utilization by sexual identity, particularly when examining these patterns across racial and ethnic groups. Specifically, we found that multi-racial sexual minority adolescents who had considered suicide, as well as multi-racial non-Latino sexual minority adolescents who made a suicide plan, exhibited distinct disparities in telemedicine use. Additionally, sexual minority AI/AN/NHPI adolescents who made a suicide plan and those who had a history of suicide attempts demonstrated unique patterns in telemedicine engagement. These findings highlight the intersectionality of sexual identity, race/ethnicity, and mental health crises, underscoring the need for targeted interventions to ensure equitable access to telemedicine services for vulnerable adolescent populations. Differences were found in telemedicine utilization among sexual and gender minority adolescents that were not present in heterosexual adolescents, further highlighting that access to and availability of telemedicine services were and are not equitably distributed across all communities. Sexual minority adolescents who experienced job loss and

Table 2 | Associations of telemedicine utilization in adolescents endorsing suicidal thoughts and behaviors by sex, 2021

Effects	Consider		Plan		Attempt	
	Male	Female	Male	Female	Male	Female
Race/Ethnicity						
Am Indian/Alaskan Native/Native Hawaiian (AI/AN/NHPI)	0.292 (0.047–1.815)	0.410 (0.164–1.029)	0.138 (0.013–1.413)	0.235 (0.093–0.591)	0.923 (0.095–8.923)	0.234 (0.077–0.715)
Black	0.616 (0.136–2.786)	0.504 (0.279–0.910)	1.305 (0.237–7.199)	0.545 (0.285–1.041)	3.994 (0.438–36.399)	0.637 (0.276–1.467)
Hispanic/Latino	0.120 (0.013–1.110)	1.127 (0.378–3.358)	0.822 (0.140–4.839)	0.839 (0.280–2.520)	0.426 (0.033–5.577)	1.028 (0.355–2.977)
Multi-race Latino	0.797 (0.335–1.894)	0.647 (0.379–1.103)	0.584 (0.311–1.095)	0.644 (0.363–1.142)	0.806 (0.260–2.497)	0.916 (0.427–1.966)
Multi-race non-Latino	0.987 (0.278–3.501)	0.738 (0.242–2.254)	1.679 (0.497–5.674)	0.625 (0.210–1.857)	2.209 (0.46–10.614)	0.678 (0.150–3.063)
White	REF	REF	REF	REF	REF	REF
Pandemic mental health not good						
Always / Most of the time	0.818 (0.295–2.270)	0.695 (0.280–1.724)	0.337 (0.099–1.152)	1.034 (0.360–2.971)	0.201 (0.032–1.274)	1.485 (0.493–4.467)
Sometimes	0.826 (0.402–1.698)	0.789 (0.431–1.442)	1.090 (0.560–2.122)	0.501 (0.264–0.954)	1.063 (0.296–3.815)	0.437 (0.167–1.149)
Never / Rarely	REF	REF	REF	REF	REF	REF
Parental job loss						
No	REF	REF	REF	REF	REF	REF
Yes	1.268 (0.725–2.215)	1.161 (0.733–1.841)	1.076 (0.550–2.103)	1.196 (0.718–1.993)	2.355 (0.846–6.555)	1.016 (0.556–1.854)
Student job loss						
No	REF	REF	REF	REF	REF	REF
Yes	1.435 (0.528–3.896)	0.700 (0.386–1.269)	1.259 (0.457–3.471)	0.936 (0.467–1.874)	2.928 (0.590–14.534)	0.800 (0.341–1.876)
Food insecurity						
No	REF	REF	REF	REF	REF	REF
Yes	0.732 (0.363–1.475)	1.010 (0.692–1.474)	1.123 (0.583–2.165)	1.253 (0.831–1.890)	0.633 (0.214–1.869)	1.048 (0.569–1.930)
School work						
No	REF	REF	REF	REF	REF	REF
Yes	1.003 (0.617–1.630)	1.459 (0.816–2.609)	0.840 (0.417–1.692)	1.072 (0.641–1.793)	0.582 (0.245–1.385)	1.125 (0.488–2.590)
Parental emotional abuse						
No	REF	REF	REF	REF	REF	REF
Yes	0.676 (0.280–1.628)	0.977 (0.540–1.769)	1.229 (0.516–2.924)	1.191 (0.639–2.220)	0.844 (0.257–2.766)	0.488 (0.168–1.416)
Parental physical abuse						
No	REF	REF	REF	REF	REF	REF
Yes	1.759 (0.981–3.155)	0.861 (0.576–1.286)	1.372 (0.663–2.841)	0.842 (0.521–1.358)	0.757 (0.322–1.778)	0.789 (0.422–1.476)
Alcohol						
No	REF	REF	REF	REF	REF	REF
Yes	0.824 (0.450–1.508)	0.911 (0.620–1.339)	1.137 (0.651–1.987)	1.051 (0.684–1.614)	1.029 (0.404–2.621)	1.275 (0.695–2.338)
Drugs						
No	REF	REF	REF	REF	REF	REF
Yes	2.585 (1.349–4.954)	1.926 (1.250–2.968)	2.237 (1.122–4.458)	1.974 (1.180–3.301)	1.921 (0.438–8.430)	1.433 (0.727–2.826)
Connectedness						
No	REF	REF	REF	REF	REF	REF
Yes	1.008 (0.469–2.163)	0.564 (0.365–0.872)	0.908 (0.374–2.203)	0.695 (0.453–1.066)	1.746 (0.519–5.867)	0.678 (0.392–1.175)

Boldface indicates statistical significance ($p < 0.05$).

Table 3 | Associations of telemedicine utilization in adolescents endorsing suicidal thoughts and behaviors by sexual identity, 2021

Effects	Consider		Plan		Attempt	
	Heterosexual	Sexual minority	Heterosexual	Sexual minority	Heterosexual	Sexual minority
Race/Ethnicity						
Am Indian/Alaskan Native/Native Hawaiian (AI/AN/NHPI)	0.522 (0.194– 1.408)	0.363 (0.131 –1.007)	0.366 (0.079– 1.687)	0.137 (0.065 –0.291)	0.642 (0.223– 1.848)	0.142 (0.039 –0.514)
Black	0.694 (0.309– 1.561)	0.500 (0.215 –1.163)	0.984 (0.389– 2.490)	0.523 (0.263 –1.039)	1.364 (0.505– 3.689)	0.392 (0.129 –1.191)
Hispanic/Latino	1.461 (0.392– 5.436)	0.685 (0.244 –1.922)	1.161 (0.393– 3.431)	0.631 (0.193 –2.068)	2.248 (0.585– 8.641)	0.503 (0.134 –1.887)
Multi-race Latino	0.918 (0.477– 1.766)	0.548 (0.328 –0.914)	0.765 (0.462– 1.268)	0.516 (0.266 –0.999)	0.786 (0.331– 1.866)	0.692 (0.253 –1.891)
Multi-race non-Latino	1.563 (0.476– 5.126)	0.429 (0.181 –1.021)	1.432 (0.407– 5.042)	0.586 (0.275 –1.250)	2.978 (0.525– 16.904)	0.386 (0.100 –1.486)
White	REF	REF	REF	REF	REF	REF
Pandemic mental health not good						
Always/Most of the time	0.678 (0.302– 1.520)	0.868 (0.312 –2.411)	0.560 (0.234– 1.343)	0.742 (0.185 –2.974)	0.821 (0.254– 2.652)	1.436 (0.272 –7.589)
Sometimes	0.808 (0.421– 1.554)	0.632 (0.320 –1.248)	0.742 (0.391– 1.407)	0.564 (0.252 –1.259)	1.677 (0.627– 4.483)	0.223 (0.059 –0.844)
Never/Rarely	REF	REF	REF	REF	REF	REF
Parental job loss						
No	REF	REF	REF	REF	REF	REF
Yes	1.465 (0.858– 2.504)	0.962 (0.615 –1.503)	1.317 (0.799– 2.170)	1.141 (0.707 –1.842)	1.757 (0.681– 4.530)	0.831 (0.425 –1.623)
Student job loss						
No	REF	REF	REF	REF	REF	REF
Yes	0.971 (0.382– 2.468)	0.845 (0.433 –1.652)	0.710 (0.240– 2.103)	1.342 (0.732 –2.460)	1.009 (0.201– 5.068)	1.255 (0.535 –2.945)
Food insecurity						
No	REF	REF	REF	REF	REF	REF
Yes	1.118 (0.763– 1.636)	0.779 (0.522 –1.162)	1.219 (0.763– 1.949)	1.100 (0.671 –1.804)	1.167 (0.559– 2.436)	0.843 (0.395 –1.799)
School work						
No	REF	REF	REF	REF	REF	REF
Yes	1.558 (0.938– 2.589)	1.090 (0.625 –1.903)	1.297 (0.828 – 2.031)	0.842 (0.440 –1.609)	1.374 (0.684– 2.762)	1.003 (0.414 –2.429)
Parental emotional abuse						
No	REF	REF	REF	REF	REF	REF
Yes	0.968 (0.571– 1.639)	0.793 (0.381 –1.648)	1.385 (0.725– 2.648)	1.232 (0.483 –3.139)	0.999 (0.449– 2.221)	0.431 (0.114 –1.629)
Parental physical abuse						
No	REF	REF	REF	REF	REF	REF
Yes	1.029 (0.615– 1.720)	1.132 (0.711 –1.804)	0.976 (0.555– 1.715)	0.891 (0.516 –1.539)	0.939 (0.420– 2.100)	0.683 (0.380 –1.228)
Alcohol						
No	REF	REF	REF	REF	REF	REF
Yes	1.159 (0.721– 1.862)	0.778 (0.430 –1.406)	1.227 (0.625– 2.410)	1.148 (0.705 –1.871)	1.391 (0.689– 2.810)	1.765 (0.781 –3.987)
Drugs						
No	REF	REF	REF	REF	REF	REF
Yes	1.648 (0.933 – 2.910)	2.327 (1.199 –4.516)	1.680 (0.890 – 3.171)	1.910 (1.027 –3.554)	1.328 (0.430– 4.097)	0.887 (0.390 –2.022)
Connectedness						
No	REF	REF	REF	REF	REF	REF
Yes	0.649 (0.392– 1.073)	0.641 (0.415 –0.991)	0.923 (0.540– 1.579)	0.632 (0.406 –0.982)	0.828 (0.407– 1.684)	0.667 (0.384 –1.158)

Boldface indicates statistical significance ($p < 0.05$).

Table 4 | Associations of telemental health care utilization in adolescents endorsing suicidal thoughts and behaviors by sex, 2021

Effects	Consider		Plan		Attempt	
	Male	Female	Male	Female	Male	Female
Race/Ethnicity						
Am Indian/Alaskan Native/Native Hawaiian (AI/AN/NHPI)	0.781 (0.124–4.930)	0.300 (0.082–1.097)	0.506 (0.041–6.301)	0.375 (0.081–1.736)	2.639 (0.246–28.316)	0.347 (0.072–1.660)
Black	0.539 (0.168–1.728)	0.485 (0.242–0.974)	0.873 (0.200–3.813)	0.506 (0.226–1.133)	0.553 (0.088–3.471)	0.495 (0.194–1.264)
Hispanic/Latino	0.825 (0.199–3.424)	0.238 (0.069–0.814)	1.075 (0.258–4.487)	0.501 (0.134–1.876)	1.638 (0.132–20.335)	0.306 (0.057–1.648)
Multi-race Latino	0.889 (0.449–1.763)	0.361 (0.194–0.673)	0.372 (0.110–1.254)	0.568 (0.292–1.107)	0.505 (0.140–1.830)	0.721 (0.260–2.000)
Multi-race non-Latino	1.275 (0.290–5.606)	1.513 (0.834–2.743)	3.057 (0.705–13.257)	1.719 (0.802–3.685)	1.628 (0.219–12.120)	2.204 (0.886–5.487)
White	REF	REF	REF	REF	REF	REF
Pandemic mental health not good						
Always/Most of the time	1.176 (0.375–3.693)	0.800 (0.292–2.192)	0.728 (0.25–2.117)	1.380 (0.441–4.321)	0.448 (0.086–2.325)	1.671 (0.484–5.767)
Sometimes	0.465 (0.177–1.223)	0.602 (0.344–1.052)	0.741 (0.254–2.164)	0.301 (0.140–0.646)	0.533 (0.097–2.917)	0.574 (0.201–1.640)
Never/Rarely	REF	REF	REF	REF	REF	REF
Parental job loss						
No	REF	REF	REF	REF	REF	REF
Yes	1.559 (0.778–3.123)	0.914 (0.612–1.363)	1.466 (0.590–3.645)	0.727 (0.458–1.155)	1.351 (0.446–4.087)	0.773 (0.393–1.520)
Student job loss						
No	REF	REF	REF	REF	REF	REF
Yes	0.973 (0.363–2.604)	1.818 (0.814–4.062)	0.903 (0.257–3.170)	2.551 (0.948–6.866)	1.163 (0.323–4.187)	2.415 (0.903–6.462)
Food insecurity						
No	REF	REF	REF	REF	REF	REF
Yes	0.895 (0.405–1.978)	0.832 (0.454–1.525)	1.532 (0.568–4.137)	1.107 (0.619–1.981)	0.983 (0.220–4.387)	0.943 (0.454–1.959)
School work						
No	REF	REF	REF	REF	REF	REF
Yes	0.490 (0.233–1.031)	0.695 (0.398–1.214)	0.376 (0.167–0.849)	0.716 (0.422–1.216)	0.414 (0.131–1.312)	0.675 (0.311–1.464)
Parental emotional abuse						
No	REF	REF	REF	REF	REF	REF
Yes	2.280 (0.957–5.429)	1.532 (0.719–3.262)	1.937 (0.689–5.448)	1.415 (0.562–3.565)	1.674 (0.409–6.849)	1.914 (0.733–4.994)
Parental physical abuse						
No	REF	REF	REF	REF	REF	REF
Yes	1.026 (0.457–2.302)	1.142 (0.748–1.744)	0.744 (0.315–1.757)	1.269 (0.770–2.090)	0.780 (0.238–2.552)	0.797 (0.420–1.515)
Alcohol						
No	REF	REF	REF	REF	REF	REF
Yes	0.916 (0.417–2.015)	1.323 (0.817–2.140)	0.863 (0.379–1.966)	1.589 (0.967–2.611)	0.430 (0.115–1.610)	1.229 (0.632–2.390)
Drugs						
No	REF	REF	REF	REF	REF	REF
Yes	1.553 (0.715–3.372)	1.128 (0.721–1.766)	3.196 (1.369–7.460)	0.979 (0.578–1.660)	1.772 (0.465–6.750)	1.058 (0.488–2.291)
Connectedness						
No	REF	REF	REF	REF	REF	REF
Yes	1.248 (0.606–2.573)	0.653 (0.419–1.019)	1.046 (0.349–3.136)	0.708 (0.438–1.146)	1.419 (0.425–4.740)	0.826 (0.428–1.595)

Boldface indicates statistical significance ($p < 0.05$).

Table 5 | Associations of telemental health care utilization in adolescents endorsing suicidal thoughts and behaviors by sexual identity, 2021

Effects	Consider		Plan		Attempt	
	Heterosexual	Sexual minority	Heterosexual	Sexual minority	Heterosexual	Sexual minority
Race/Ethnicity						
Am Indian/Alaskan Native/Native Hawaiian (AI/AN/NHPI)	0.227 (0.043– 1.204)	0.491 (0.134 –1.801)	0.492 (0.103– 2.339)	0.443 (0.090 –2.184)	0.671 (0.132– 3.404)	0.531 (0.114 –2.481)
Black	0.203 (0.070–0.590)	0.844 (0.354 –2.013)	0.557 (0.188– 1.647)	0.632 (0.288 –1.386)	0.023 (0.005–0.116)	0.912 (0.267 –3.122)
Hispanic/Latino	0.439 (0.122– 1.581)	0.230 (0.050 –1.053)	0.755 (0.215– 2.651)	0.413 (0.084 –2.026)	0.847 (0.161– 4.469)	0.194 (0.021 –1.781)
Multi-race Latino	0.660 (0.315– 1.382)	0.359 (0.204 –0.631)	0.700 (0.327– 1.496)	0.411 (0.210 –0.803)	0.442 (0.158– 1.240)	0.482 (0.200 –1.161)
Multi-race non-Latino	1.525 (0.436– 5.337)	1.451 (0.756 –2.785)	2.009 (0.386– 10.444)	2.067 (0.969 –4.410)	1.599 (0.189– 13.551)	2.915 (1.217 –6.980)
White	REF	REF	REF	REF	REF	REF
Pandemic mental health not good						
Always/Most of the time	1.408 (0.455– 4.362)	0.693 (0.229 –2.096)	1.496 (0.542– 4.133)	0.533 (0.144 –1.971)	1.913 (0.434– 8.429)	0.719 (0.193 –2.682)
Sometimes	0.720 (0.267– 1.941)	0.420 (0.186 –0.946)	0.299 (0.111–0.806)	0.448 (0.192 – 1.044)	1.121 (0.176–7.129)	0.418 (0.117 –1.500)
Never/Rarely	REF	REF	REF	REF	REF	REF
Parental job loss						
No	REF	REF	REF	REF	REF	REF
Yes	1.022 (0.633– 1.652)	0.884 (0.550 –1.420)	0.663 (0.410– 1.073)	0.897 (0.541 –1.488)	0.456 (0.170– 1.220)	0.938 (0.434 –2.025)
Student job loss						
No	REF	REF	REF	REF	REF	REF
Yes	1.197 (0.658– 2.177)	2.034 (0.771 –5.364)	1.157 (0.586– 2.283)	3.206 (1.200 –8.565)	0.956 (0.343– 2.664)	4.589 (1.492 –14.111)
Food insecurity						
No	REF	REF	REF	REF	REF	REF
Yes	0.863 (0.476– 1.564)	0.824 (0.459 –1.480)	1.313 (0.612– 2.817)	0.969 (0.539 –1.743)	1.615 (0.586– 4.452)	0.805 (0.327 –1.980)
School work						
No	REF	REF	REF	REF	REF	REF
Yes	0.760 (0.399– 1.449)	0.655 (0.392 –1.097)	0.549 (0.295– 1.019)	0.912 (0.462 –1.801)	0.905 (0.408– 2.010)	0.897 (0.338 –2.380)
Parental emotional abuse						
No	REF	REF	REF	REF	REF	REF
Yes	1.410 (0.720– 2.762)	1.726 (0.707 –4.213)	1.243 (0.610– 2.533)	2.344 (0.720 –7.631)	1.245 (0.374– 4.141)	4.537 (1.069 –19.264)
Parental physical abuse						
No	REF	REF	REF	REF	REF	REF
Yes	1.419 (0.697– 2.890)	0.817 (0.486 –1.372)	1.636 (0.747– 3.586)	0.706 (0.394 –1.264)	0.947 (0.376– 2.382)	0.553 (0.262 –1.169)
Alcohol						
No	REF	REF	REF	REF	REF	REF
Yes	1.140 (0.654– 1.988)	1.289 (0.692 –2.401)	1.316 (0.614– 2.821)	1.711 (0.866 –3.380)	0.881 (0.402– 1.927)	1.179 (0.561 –2.477)
Drugs						
No	REF	REF	REF	REF	REF	REF
Yes	1.439 (0.866– 2.389)	0.952 (0.531 –1.708)	1.459 (0.712– 2.989)	1.025 (0.539 –1.946)	1.271 (0.527– 3.068)	0.811 (0.331 –1.990)
Connectedness						
No	REF	REF	REF	REF	REF	REF
Yes	0.778 (0.424– 1.427)	0.753 (0.450 –1.261)	0.975 (0.538– 1.770)	0.695 (0.395 – 1.222)	0.898 (0.358 – 2.252)	0.829 (0.367 – 1.872)

Boldface indicates statistical significance ($p < 0.05$).

had a history of suicidal thoughts or behaviors were significantly more likely to utilize telemental health care. Specifically, those who had planned a suicide had more than three times the odds of using telemental health services while those who had attempted suicide had nearly five times the odds. These findings suggest that economic hardship, compounded by severe mental health struggles, may drive adolescents toward seeking remote mental health support. Furthermore, among sexual minority adolescents with a history of suicide attempts, those who had experienced parental emotional abuse had more than quadruple the odds of engaging in telemental health services compared to those without such experiences. This underscores the role of adverse family dynamics in shaping health care-seeking behavior³⁷. Adolescents in unsupportive or abusive households may face significant barriers to accessing in-person mental health care due to stigma, transportation challenges, or parental control, making telemental health a critical alternative. Additionally, job loss may contribute to financial and psychological distress, further exacerbating the risk of suicidality and increasing the likelihood of seeking help through more accessible and private means. These findings highlight the urgent need for targeted interventions to support sexual minority adolescents facing economic hardship, family adversity, and mental health crises, ensuring that telemental health services remain accessible and equipped to meet their unique needs.

Disparities in telemedicine utilization endure, particularly among vulnerable populations such as sexual and gender minority (SGM) youth. SGM youth experience disproportionately high rates of mental health challenges, including depression, anxiety, and suicidality, which were worsened by the isolation and stressors of the pandemic³⁸. Such disparities are exacerbated by systemic inequities, including economic barriers, digital literacy challenges, and the stigma faced by SGM individuals in health care settings^{17,39,40}. Findings from The Trevor Project's 2024 National Survey revealed that "39% of LGBTQ+ young people seriously considered attempting suicide in the past year, including 46% of transgender and nonbinary young people."⁴⁰ Furthermore, 50% of LGBTQ+ youth who wanted mental health care were unable to access it, with affordability, fear of stigma, and concerns about safety cited as significant barriers⁴⁰. Gender also intersects with age and sexual orientation in shaping telemedicine usage. For example, cisgender females are more likely to use telemedicine for mental health concerns compared to cisgender males. This trend may reflect greater health-seeking behavior among females and a higher prevalence of diagnosed mental health conditions^{41,42}. Telemedicine offers a promising service delivery tool for addressing these disparities by providing remote access to affirming care. However, structural inequities and intersecting barriers limit its accessibility. For example, survey data highlighted that only 42% of LGBTQ+ youth received counseling in the past year, and concerns about losing access to gender-affirming care were prevalent among transgender and nonbinary respondents^{40,43}.

Lower-income families, which disproportionately include racial/ethnic minority groups, may have limited access to reliable internet, smartphones, or private spaces necessary for telemedicine^{44,45}. We believe this may also be attributed to their perceptions of care. Historical and ongoing disparities in health care treatment may contribute to skepticism about telemedicine's effectiveness, confidentiality, and privacy particularly among Black and Hispanic communities despite living in communities with greater telemedicine availability but having fewer telemedicine services than their White counterparts^{46–48}. In some racial/ethnic minority groups, mental health struggles may be underreported due to stigma, family expectations, or a preference for informal coping mechanisms over clinical interventions⁴⁹.

This study has several limitations that should be considered. The ABES was administered as a one-time survey to students enrolled in schools and is not representative of all U.S. adolescents²³. Additionally, it was administered during the COVID-19 pandemic and does not allow for causality and directionality of the findings to be determined; it is further limited by the temporal context that behaviors and attitudes may have significantly shifted due to varying factors during the pandemic. Although the data has been adjusted with weights, the low overall response rate indicates potential for nonresponse bias. Additionally, there is potential for self-reporting or

response bias despite the protocols in place to protect respondents' privacy. Finally, as the ABES dataset consists of CDC-developed questions which were not previously validated, the reliability and validity of the measures cannot be assured, which limits the generalizability of our results.

In lieu of these limitations, we commend that intersectionality and structural awareness is embedded into every level of telehealth design and clinical practice so that care is not only clinical competent, but also affirming, accessible and responsive to the layered inequities that many adolescents face. While telemedicine holds potential to alleviate some barriers to care, it must be implemented with attention to intersectionality and SDH. For example, affirming telemedicine practices, such as respecting gender identity and providing culturally competent care, can mitigate the effects of minority stress and improve outcomes^{41,50}. Additionally, structural interventions, such as expanding broadband access in rural areas and subsidizing telehealth services for low-income families, are critical to addressing disparities^{18,43}.

By applying an intersectional lens and addressing SDH, health care systems can better meet the needs of adolescents. This approach not only improves access to telemedicine but also fosters a more equitable and affirming health care environment for these marginalized populations. In conclusion, our findings show that recognizing these sex differences is critical for designing equitable telemedicine systems. Policies that address technological literacy and financial barriers for women, while also targeting societal stigma around men's health-seeking behaviors, are essential^{17,41}. Additionally, promoting culturally competent and gender-sensitive telemedicine practices can improve access and utilization for all genders, particularly for those in marginalized communities^{17,41}. By addressing these differences in telemedicine access, health care systems can reduce disparities and ensure that telehealth services are equitable and effective for all populations.

Data availability

The data that support the findings of this study are openly available from the CDC's ABES Data & Documentation at <https://www.cdc.gov/abes/data/index.html>.

Received: 10 April 2025; Accepted: 11 December 2025;

Published online: 10 January 2026

References

- Hwang, T. J., Rabheru, K., Peisah, C., Reichman, W. & Ikeda, M. Loneliness and social isolation during the COVID-19 pandemic. *Int Psychogeriatr.* **32**, 1217–1220 (2020).
- Frutos M. L., Cruzado D. P., Lunsford D., Orza S. G., Cantero-Téllez R. Impact of social isolation due to COVID-19 on daily life activities and independence of people over 65: a cross-sectional study. *Int. J. Environ. Res. Public Health.* **20**. <https://doi.org/10.3390/ijerph20054177>(2023).
- Liu, H. et al. Daily routine disruptions and psychiatric symptoms amid COVID-19: a systematic review and meta-analysis of data from 0.9 million individuals in 32 countries. *BMC Med.* **22**, 49 (2024).
- Shehzad, K., Xiaoxing, L., Bilgili, F. & Koçak, E. COVID-19 and spillover effect of global economic crisis on the United States' financial stability. *Front. Psychol.* **12**, 632175 (2021).
- Wang, C., Horby, P. W., Hayden, F. G. & Gao, G. F. A novel coronavirus outbreak of global health concern. *lancet* **395**, 470–473 (2020).
- Killgore, W. D., Cloonan, S. A., Taylor, E. C. & Dailey, N. S. Loneliness: a signature mental health concern in the era of COVID-19. *Psychiatry Res.* **290**, 113117 (2020).
- Twenge, J. M. & Joiner, T. E. Mental distress among U.S. adults during the COVID-19 pandemic. *J. Clin. Psychol.* **76**, 2170–2182 (2020).
- Batra, K., Pharr, J. R., Kachen, A., Godbey, S. & Terry, E. Investigating the psychosocial impact of COVID-19 among the sexual and gender minority population: a systematic review and meta-analysis. *LGBT Health* **10**, 416–428 (2023).

9. Prichett, L. M. et al. COVID-19 and youth mental health disparities: intersectional trends in depression, anxiety and suicide risk-related diagnoses. *Acad. Pediatr.* **24**, 837–847 (2024).
10. Salerno, J. P., Gattamorta, K. A. & Williams, N. D. Impact of family rejection and racism on sexual and gender minority stress among LGBTQ young people of color during COVID-19. *Psychol. Trauma* **15**, 637–647 (2023).
11. Krause, K. H. Disruptions to school and home life among high school students during the COVID-19 pandemic—Adolescent Behaviors and Experiences Survey, United States, January–June 2021. *MMWR Suppl.* **71**, (2022).
12. DeGuzman, P. B. et al. Impact of telemedicine on access to care for rural transgender and gender-diverse youth. *J. Pediatr.* **267**, 113911 (2024).
13. Kemp, E. et al. Health literacy, digital health literacy and the implementation of digital health technologies in cancer care: the need for a strategic approach. *Health Promot. J. Aust.* **32**, 104–114 (2021).
14. Steinke, J., Root-Bowman, M., Estabrook, S., Levine, D. S. & Kantor, L. M. Meeting the needs of sexual and gender minority youth: formative research on potential digital health interventions. *J. Adolesc. Health* **60**, 541–548 (2017).
15. Husain, L., Greenhalgh, T., Hughes, G., Finlay, T. & Wherton, J. Desperately seeking intersectionality in digital health disparity research: narrative review to inform a Richer theorization of multiple disadvantage. *J. Med. Internet Res.* **24**, e42358 (2022).
16. Office of Disease Prevention and Health Promotion, U.S. Department of Health and Human Services (n.d.). *Social Determinants of Health*. Accessed February 20, 2025 from <https://odphp.health.gov/healthypeople/priority-areas/social-determinants-health>.
17. Silveri, G. et al. Barriers in care pathways and unmet mental health needs in LGBTIQ+ communities. *Int Rev. Psychiatry* **34**, 215–229 (2022).
18. Zullo, L. et al. Treatment recommendations and barriers to care for suicidal LGBTQ youth: a quality improvement study. *Evid. Based Pract. Child Adolesc. Ment. Health* **6**, 393–409 (2021).
19. Nath, R. et al. *U.S. National Survey on the Mental Health of LGBTQ+ Young People* (The Trevor Project, 2024).
20. Campanozzi, L. L. et al. The role of digital literacy in achieving health equity in the third millennium society: a literature review. *Front. public health* **11**, 1109323 (2023).
21. Marshall, A. et al. Health literacy among sexual and gender-diverse adolescents in New York City. *Health Educ. Behav.* **52**, 289–298 (2025).
22. Kahn, N. F. et al. Understanding transgender and gender-diverse youth's experiences receiving care via telemedicine: qualitative interview study. *JMIR Pediatr. Parent* **6**, e42378 (2023).
23. Rico, A. et al. Overview and methodology of the adolescent behaviors and experiences survey—United States, January–June 2021. *MMWR Suppl.* **71**, 1–7 (2022).
24. U.S. Centers for Disease Control and Prevention (n.d.). *Adolescent Behaviors and Experiences Survey (ABES) Data and Documentation*. Accessed January 20, 2025 from <https://www.cdc.gov/abes/data/index.html>.
25. Gómez, C. A. et al. Addressing health equity and social determinants of health through healthy people 2030. *J. Public Health Manag. Pract.* **27**, S249–S257 (2021).
26. Siller, A. & Tompkins, L. *The Big Four: Analyzing Complex Sample Survey Data Using SAS®, SPSS®, STATA®, and SUDAAN®*, 172–31(2006).
27. Lee, J. O. et al. Unemployment and substance use problems among young adults: Does childhood low socioeconomic status exacerbate the effect?. *Soc. Sci. Med.* **143**, 36–44 (2015).
28. Osilla, K. C. et al. The effects of employment among adolescents at risk for future substance use. *Addictive Behav.* **38**, 1616–1619 (2013).
29. Unger, J. B., Hamilton, J. E. & Sussman, S. A family member's job loss as a risk factor for smoking among adolescents. *Health Psychol.* **23**, 308 (2004).
30. Valois, R. F., Dunham, A. C., Jackson, K. L. & Waller, J. Association between employment and substance abuse behaviors among public high school adolescents. *J. Adolesc. Health* **25**, 256–263 (1999).
31. Jones, S. E. et al. Family economics and mental health among high-school students during COVID-19. *Am. J. Prev. Med.* **64**, 414–422 (2023).
32. Inanc, H. *Breaking Down the Numbers: What Does COVID-19 Mean for Youth Unemployment?* 2020.
33. Narcisse, M. R. et al. Factors associated with telehealth use among adults in the United States: Findings from the 2020 National Health Interview Survey. *J. Telemed. Telecare* **30**, 993–1004 (2024).
34. Rodriguez, J. A., Saadi, A., Schwamm, L. H., Bates, D. W. & Samal, L. Disparities in telehealth use among california patients with limited english proficiency. *Health Aff.* **40**, 487–495 (2021).
35. Breslau, J. et al. Telehealth use for mental health treatment among US adolescents. *J. Adolesc. Health* **77**, 277–283 (2025).
36. Giannotti, M., Mazzoni, N., Bentenuto, A., Venuti, P. & de Falco, S. Family adjustment to COVID-19 lockdown in Italy: parental stress, coparenting, and child externalizing behavior. *Fam. Process* **61**, 745–763 (2022).
37. Hammond, N. G. et al. The relationship between family dynamics and help-seeking and disclosure of adolescent self-harm and suicidality: a population-representative study: relation entre dynamique familiale et recherche d'aide, et dévoilement des actes d'automutilation et de la suicidalité chez les adolescents : étude représentative de la population. *Can J. Psychiatry* **70**. <https://doi.org/10.1177/07067437251315526> (2025).
38. Mitchell, K. J., Ybarra, M. L., Banyard, V., Goodman, K. L. & Jones, L. M. Impact of the COVID-19 pandemic on perceptions of health and well-being among sexual and gender minority adolescents and emerging adults. *LGBT Health* **9**, 34–42 (2022).
39. Lucas, R. et al. Telemedicine utilization among transgender and gender-diverse adolescents before and after the COVID-19 pandemic. *Telemed. J. e-Health* <https://doi.org/10.1089/tmj.2022.0382> (2023).
40. The Trevor Project. *2024 U.S. National Survey on the Mental Health of LGBTQ+ Young People*. <https://www.thetrevorproject.org/survey-2024/>(2024).
41. Fowler, J. A. et al. Digital mental health interventions: a narrative review of what is important from the perspective of LGBTQIA+ people. *J. Clin. Psychol.* **79**, 2685–2713 (2023).
42. Waselewski, M. E. et al. Perspectives on telemedicine from a national study of youth in the United States. *Telemed. e-Health* **28**, 575–582 (2022).
43. Harris, A. et al. Disparities in telemedicine literacy and access in the United States. *Plast. Reconstr. Surg.* **151**, 677–685 (2023).
44. Saeed, S. A. & Masters, R. M. Disparities in health care and the digital divide. *Curr. Psychiatry Rep.* **23**, 61 (2021).
45. Iasiello, J. A., Rajan, A., Zervos, E., Parikh, A. A. & Snyder, R. A. Racial differences in patient-reported access to telehealth: an important and unmeasured social determinant of health. *JCO Oncol. Pract.* **19**, 1215–1223 (2023).
46. George, S., Hamilton, A. & Baker, R. S. How do low-income urban African Americans and Latinos feel about telemedicine? A diffusion of innovation analysis. *Int. J. Telemed. Appl.* **2012**, 715194 (2012).
47. Marcondes, F. O. et al. Racial and ethnic differences in telemedicine use. *JAMA Health Forum* **5**, e240131–e240131 (2024).
48. Perez-Brescia, M. Factors affecting Hispanics' access to healthcare during the COVID-19 pandemic: an integrative review. *Online J. Issues Nurs.* **27**, 5–5 (2022). Article.
49. Rivera, K. J., Zhang, J. Y., Mohr, D. C., Wescott, A. B. & Pederson, A. B. A narrative review of mental illness stigma reduction interventions

- among African Americans in the United States. *J. Ment. Health Clin. Psychol.* **5**, 20–31 (2021).
50. Inwards-Breland, D. J. et al. Facilitators and barriers to using telemedicine for gender-affirming care in gender-diverse youth: a qualitative study. *J. Telemed. Telecare* <https://doi.org/10.1177/1357633x241231015> (2024).

Author contributions

M.G.: conceptualized the study; curated the data; conducted the formal analyses; developed methodology; oversaw project administration; visualized the data; wrote, reviewed, and edited the original draft and final manuscript. H.H.: wrote, reviewed, and edited the original draft and final manuscript with M.G. T.G.: reviewed and edited the final draft. All authors review the manuscript.

Competing interests

The authors declare no competing interests.

Additional information

Correspondence and requests for materials should be addressed to Morgan J. Grant.

Reprints and permissions information is available at <http://www.nature.com/reprints>

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Open Access This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

© The Author(s) 2026