

# Racial and Ethnic Disparities in Telemental Health Use Among Publicly Insured Children

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The prevalence of mental health (MH) disorders among children has increased in recent years and access to MH care remains a challenge, which presents a pressing public health concern.<sup>1,2</sup> For example, the prevalence of major depressive disorder increased from 8.1% to 15.8% between 2009 and 2019 among US adolescents aged 12 to 17 years<sup>3</sup> and further increased to 20.1% in 2021.<sup>4</sup> Children from low-income families face even greater risk for MH disorders,<sup>3,5,6</sup> due to a confluence of individual-level risk factors (eg, higher exposure to stressors and trauma)<sup>5,7,8</sup> and family- and community-level risk factors (eg, food and housing problems, residence in communities with higher rates of crime and violence).<sup>5,9,10</sup> There are also more access barriers to MH care for children from low-income and racial and ethnic minority backgrounds.<sup>11,12</sup> Consequently, these groups are more likely to experience unmet MH needs that could have consequences for morbidity and mortality.<sup>13,14</sup>

Although the underlying prevalence of MH disorders does not typically differ by race and ethnicity, racial and ethnic inequities in MH treatment among children are well documented.<sup>15,16</sup> Public insurance programs including Medicaid and the Children's Health Insurance Program (CHIP) provide insurance to more than 40 million children who are from low-income families, involved in the child welfare system, and/or with disabilities.<sup>17</sup> These programs cover a disproportionate number of children from racial and ethnic minority backgrounds, including 60% of Black and 55% of Hispanic children.<sup>18</sup> Publicly insured children are more likely than their privately insured peers to have barriers to MH services, including long distances to the nearest provider, unreliable transportation, and limited availability of providers accepting Medicaid.<sup>19-21</sup> Some of these barriers, such as access to safety-net providers, may be more pronounced in communities with a larger percentage of Black or Hispanic residents.<sup>19,22</sup> Furthermore, a growing body of work has documented individual-level inequities in MH treatment receipt, discontinuities, and quality among publicly insured children from racial and ethnic minority groups compared with their non-Hispanic (NH) White peers.<sup>15,23,24</sup>

The COVID-19 pandemic catalyzed the rapid adoption of telehealth by state legislatures, health care organizations, and providers.<sup>25,26</sup> Telemental health use increased more than 8-fold among publicly

## ABSTRACT

**OBJECTIVES:** The COVID-19 pandemic propelled telemental health utilization among children seeking mental health (MH) services. We examined racial and ethnic disparities in telemental health use among publicly insured children before and following COVID-19.

**METHODS:** We identified 36,877,141 child-year observations among publicly insured children aged 3 to 17 years with MH-related encounters in a given year from 2016 to 2020. Multivariable linear regressions controlling for individual- and county-level confounders estimated changes in telemental health use before (2016-2019) and following the pandemic (2020) and how these changes differed by individual- and county-level race and ethnicity.

**RESULTS:** The percentage of publicly insured children using telemental health increased from 2.74% pre-COVID-19 to 35.90% in 2020. Among non-Hispanic White children, 3.41% used telemental health care pre-COVID-19, which increased by 36.49 percentage points (PP) in 2020. Non-Hispanic Black children had a lower percentage of telemental health use (2.50%) pre-COVID-19, which increased by 31.20 PP in 2020, resulting in a 5.39 PP smaller increase than non-Hispanic White children ( $P < .001$ ). Similarly, Hispanic, non-Hispanic Asian, and non-Hispanic Pacific Islander children had 6.19 PP, 15.45 PP, and 12.10 PP smaller increases in telemental health use in 2020 compared with non-Hispanic White children (all  $P < .001$ ). Moreover, children in counties with the highest (vs lowest) quartiles of non-Hispanic Black and Hispanic populations had lower pre-COVID-19 telemental health use and smaller increases in 2020 (all  $P < .001$ ).

**CONCLUSIONS:** Racial and ethnic disparities in telemental health use widened following COVID-19. Future research should evaluate how telemental health use impacted MH care quality and outcomes among publicly insured children.

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insured children in 2020, and in-person MH services in traditional care settings (eg, outpatient clinics) declined.<sup>27</sup> MH providers and professional societies highlight the potential for telemental health to address barriers linked to transportation and scheduling and, therefore, improve access to and equity of MH services.<sup>28-30</sup> However, a prior report indicated that publicly insured racial and ethnic minority youth were less likely to receive telemental health services.<sup>16</sup>

Although the volume of telemental health services declined as in-person work and school resumed,<sup>31</sup> this shift toward telehealth may still have long-term implications for access to care and equity among publicly insured children. Moreover, given that a significant portion of MH services will continue to be delivered via telehealth in many states,<sup>32</sup> more data are needed to understand how telemental health varies by individual-level race and ethnicity and across communities with a higher proportion of racial and ethnic minority residents.

To advance the literature, we used national data and estimated regression models to examine racial and ethnic differences in telemental health use at the onset of the COVID-19 pandemic vs pre-COVID-19 for publicly insured children with MH-related encounters. We examined these differences based on individual-level racial and ethnic identity and compared telemental health use across communities based on racial and ethnic composition.

## METHODS

### Data and Sample

We used national 100% Medicaid administrative data from the 2016-2020 Medicaid and CHIP Transformed Medicaid Statistical Information System Analytic Files (TAF) through the Virtual Research Data Center (VRDC) Chronic Conditions Warehouse.<sup>33</sup> The Annual Demographic and Eligibility files were used to extract demographic and eligibility information for all Medicaid and CHIP beneficiaries, and claims files were used to extract health service utilization.

We merged in county-level characteristics using state and county Federal Information Processing System (FIPS) codes. For enrollees missing county FIPS codes, we used enrollee zip codes and subsequently applied the zip code-county crosswalk files from the Department of Housing and Urban Development website. County-level characteristics were extracted from (1) Area Health Resources Files, which included county-level percentage of Black population and Hispanic population, and MH provider shortage areas<sup>34</sup>; (2) 2013 Rural-Urban Continuum Codes to measure metropolitan residency<sup>35</sup>; and (3) Social Deprivation Index county files.<sup>36</sup> Continuous county-level measures were classified into quartiles for statistical analysis. See the detailed description of our data sources in [eAppendix Table 1](#) (eAppendix available at [ajmc.com](#)).

We identified Medicaid or CHIP beneficiaries aged 3 to 17 years who had any MH-related encounters in a given year between

## TAKEAWAY POINTS

- ▶ The COVID-19 pandemic propelled a rapid shift to telehealth utilization, including among children seeking mental health services.
- ▶ More data are needed to understand racial and ethnic inequities in telemental health use among this population.
- ▶ We evaluated claims data from 2016 to 2020 among publicly insured children with mental health-related encounters and found that racial and ethnic disparities in telemental health use widened following the onset of the COVID-19 pandemic compared with prior years.

2016 and 2020. MH-related encounters were defined as having at least 1 claim with an MH diagnosis and/or at least 1 claim with a procedure code indicative of an MH service within a given year from the TAF Other Services Files. Detailed codes used to identify MH diagnoses and MH services were obtained from existing literature and the Clinical Classifications Software ([eAppendix Tables 2 and 3](#)) and were reviewed by a clinical psychologist on our study team (J.G.M.).<sup>23,24</sup>

We included those with at least 1 month of Medicaid or CHIP enrollment in a given year; we excluded children who were enrolled only because they were classified as an “uninsured individual eligible for COVID-19 testing” in the year (1.5%) and children with missing sociodemographic and county-level characteristics (4.9%). A detailed sample derivation process is provided in the [eAppendix Figure](#). Notably, the data quality of TAF varies across states and by data elements because data are collected by each state’s Medicaid agency.<sup>37</sup> Therefore, we also conducted sensitivity analysis among 23 states that did not have high data quality concerns in data files that capture key study measures (ie, outpatient care and race and ethnicity) between 2016 and 2020 ([eAppendix Table 4](#)).<sup>38</sup>

Emory University Institutional Review Board approved this study and waived the requirement to obtain informed consent.

### Telemental Health Utilization

Our outcome measure was the use of any telemental health in the year (yes/no), defined as having at least 1 claim for a telehealth visit with (1) an MH diagnosis code and/or (2) an MH service procedure code ([eAppendix Tables 2 and 3](#)). Telemental health visits were identified using place of service code, modifiers, and/or procedure codes specific to telehealth visits from the TAF Other Services Files ([eAppendix Table 5](#)).<sup>1,3-7</sup>

### Race and Ethnicity

Individual-level race and ethnicity was assessed with 7 mutually exclusive categories: NH White, NH Black, Hispanic, NH American Indian and/or Alaska Native (AIAN), NH Asian, NH Pacific Islander, and other/multirace groups. An additional category was included to categorize those with missing race and ethnicity. County-level racial and ethnic composition were assessed with 2 categorical measures to indicate the quartiles of the percentage of residents who were NH Black and Hispanic.

### Other Covariates

Individual-level demographic characteristics included children's age groups (3-5 years, 6-11 years, and 12-17 years) and biological sex. County-level characteristics included metropolitan status, MH professional shortage areas, and quartiles of Social Deprivation Index. Social Deprivation Index is a composite measure of area-level deprivation based on 7 demographic characteristics (poverty, employment, education, rented housing, overcrowded housing, household composition, and vehicle ownership) collected in the American Community Survey.<sup>36</sup>

### Statistical Analysis

We described individual- and county-level characteristics of our sample stratified by the pre-COVID-19 years (2016-2019) and the first year of the pandemic (2020). We plotted the unadjusted proportion of children with telemental health utilization annually between 2016 and 2020, overall and by individual-level race and ethnicity and county-level measures of racial and ethnic composition.

We used linear probability models to estimate the absolute percentage point (PP) difference in telemental health utilization in 2016 to 2019 vs 2020. Unadjusted absolute changes were obtained through regressions with a binary indicator for pre-COVID-19 years (2016-2019) vs 2020, and adjusted absolute changes were estimated by adding control variables for the individual- and county-level measures described earlier. Stratified analyses were conducted to estimate changes in utilization within each individual-level or county-level characteristic group. To evaluate differential changes in telemental health utilization with COVID-19 across these subgroups, we estimated models with interaction terms between each characteristic and the year indicator, adjusting for other study covariates. Results from this model tested whether pre-COVID-19 differences between 2 subgroups (eg, NH Black vs NH White) narrowed, remained similar, or widened during 2020.

Statistical significance was determined by *P* values less than .05 using 2-sided tests. Data analyses were conducted using SAS Enterprise Guide 7.1 available through the VRDC.

## RESULTS

### Sample Characteristics

We identified 36,877,141 child-year observations among publicly insured children with MH-related encounters in a given year, including 28,563,653 observations (77.5%) in 2016 to 2019 and 8,313,488 observations (22.5%) in 2020 (Table 1<sup>34-36</sup>). Nearly two-fifths (13,571,043 observations; 36.8%) were NH White, 17.3% (6,376,344 observations) were NH Black, 22.6% (8,336,040 observations) were Hispanic, 1.4% (501,557 observations) were NH AIAN, 2.1% (759,225 observations) were NH Asian, and 0.3% (113,881 observations) were NH Pacific Islander. More than half were male (57.0%), and 43.0% were aged 12 to 17 years. Most of the children resided in metropolitan areas (82.6%) and 25.0% resided in counties in which the entire county was designated as an MH professional shortage area.

### Overall Change in Telemental Health Use With COVID-19

The proportion of children with MH-related encounters utilizing telemental health was 2.74% in 2016 to 2019 and increased to 35.90% in 2020. This increase corresponded to an adjusted increase of 33.23 PP (95% CI, 33.21-33.25) after controlling for individual-level and county-level characteristics (Table 2<sup>34-36</sup>).

### Racial and Ethnic Differences in Telemental Health Use and Changes With COVID-19

Pre-COVID-19, compared with NH White children (3.41%), lower telemental health utilization was observed among NH Black (2.50%), Hispanic (1.84%), NH Asian (0.92%), NH Pacific Islander (1.88%), and NH AIAN children (3.81%). These racial and ethnic minority groups also experienced smaller absolute increases in telemental health utilization in 2020 in adjusted models compared with NH White children (36.49 PP; 95% CI, 36.45-36.52): 31.20 PP (95% CI, 31.15-31.25) for NH Black, 30.40 PP (95% CI, 30.36-30.44) for Hispanic, 21.17 PP (95% CI, 21.06-21.29) for NH Asian, 24.80 PP (95% CI, 24.47-25.14) for NH Pacific Islander, and 36.85 PP (95% CI, 36.66-37.05) for NH AIAN children (Table 2 and Figure [A]). Models with year and race/ethnicity interaction terms showed that disparities widened between NH White children and other racial and ethnic groups. Specifically, compared with NH White peers, the increase in telemental health care was 5.39 PP smaller among NH Black ( $P < .001$ ), 6.19 PP smaller among Hispanic ( $P < .001$ ), 15.45 PP smaller among NH Asian ( $P < .001$ ), 12.10 PP smaller among NH Pacific Islander ( $P < .001$ ), and 0.42 PP larger among NH AIAN children ( $P = .020$ ) (Table 2).

There were also differences in telemental health use by county-level racial and ethnic composition (Table 2 and Figure [B and C]). Compared with counties in the lowest quartiles of percentage of NH Black residents, children in counties in the higher quartiles had lower telemental health use before COVID-19 (3.39%, 3.23%, and 1.98% in quartiles 2, 3, and 4 vs 4.15% in quartile 1; all  $P < .001$ ), and smaller increases in telemental health use post COVID-19. Children living in counties with the highest quartile of NH Black residents experienced 5.32 PP smaller increases in telemental health use than children living in counties with the lowest quartile of NH Black residents ( $P < .001$ ). Similarly, children living in counties classified in the highest (vs lowest) quartile of Hispanic residents had lower telemental health utilization before COVID-19 (2.44% in quartile 4 vs 4.08% in quartile 1;  $P < .001$ ) and a 3.22 PP smaller increase in 2020 ( $P < .001$ ).

### Other Correlates With Telemental Health Use and Changes With COVID-19

Before COVID-19, a higher proportion of children residing in nonmetropolitan urban areas (4.53%) and rural areas (5.27%) used telemental health than those in metropolitan areas (2.34%). In 2020, nonmetropolitan urban and rural residents experienced 33.78 PP (95% CI, 33.72-33.83) and 34.97 PP (95% CI, 34.78-35.15) increases in telemental health use, which were 0.71 PP and 1.80 PP larger

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**TABLE 1.** Sample Characteristics Among Publicly Insured Children With Mental Health–Related Encounters<sup>34-36</sup>

Characteristics	2016-2019		2020		Total	
	n	Column %	n	Column %	n	Column %
Total	28,563,653	100.0%	8,313,488	100.0%	36,877,141	100.0%
Age groups						
3-5 years	4,675,326	16.4%	1,295,343	15.6%	5,970,669	16.2%
6-11 years	11,617,732	40.7%	3,117,809	37.5%	14,735,541	40.0%
12-17 years	12,270,595	43.0%	3,900,336	46.9%	16,170,931	43.9%
Sex						
Male	16,413,636	57.5%	4,621,035	55.6%	21,034,671	57.0%
Female	12,150,017	42.5%	3,692,453	44.4%	15,842,470	43.0%
Race and ethnicity						
NH White	10,482,546	36.7%	3,088,497	37.2%	13,571,043	36.8%
NH Black	4,967,668	17.4%	1,408,676	16.9%	6,376,344	17.3%
Hispanic	6,432,037	22.5%	1,904,003	22.9%	8,336,040	22.6%
NH AIAN	402,386	1.4%	99,171	1.2%	501,557	1.4%
NH Asian	578,552	2.0%	180,673	2.2%	759,225	2.1%
NH Pacific Islander	87,739	0.3%	26,142	0.3%	113,881	0.3%
NH multirace	99,256	0.3%	60,089	0.7%	159,345	0.4%
Missing	5,513,469	19.3%	1,546,237	18.6%	7,059,706	19.1%
County-level percent NH Black population by Q <sup>a</sup>						
Q1 (0.00%-0.71%)	1,802,042	6.3%	458,995	5.5%	2,261,037	6.1%
Q2 (0.71%-2.22%)	3,855,591	13.5%	1,111,832	13.4%	4,967,423	13.5%
Q3 (2.22%-10.17%)	9,778,554	34.2%	2,913,654	35.0%	12,692,208	34.4%
Q4 (10.17%-85.87%)	13,127,466	46.0%	3,829,007	46.1%	16,956,473	46.0%
County-level percent Hispanic population by Q <sup>a</sup>						
Q1 (0.50%-2.39%)	2,793,104	9.8%	656,686	7.9%	3,449,790	9.4%
Q2 (2.39%-4.37%)	3,495,118	12.2%	988,517	11.9%	4,483,635	12.2%
Q3 (4.37%-9.89%)	7,446,919	26.1%	2,203,543	26.5%	9,650,462	26.2%
Q4 (9.89%-96.36%)	14,828,512	51.9%	4,464,742	53.7%	19,293,254	52.3%
County-level metropolitan status <sup>b</sup>						
Metropolitan	23,557,705	82.5%	6,914,728	83.2%	30,472,433	82.6%
Nonmetropolitan urban	4,525,084	15.8%	1,265,715	15.2%	5,790,799	15.7%
Rural	480,864	1.7%	133,045	1.6%	613,909	1.7%
Mental health professional shortage areas <sup>a</sup>						
None of the county	1,719,747	6.0%	442,969	5.3%	2,162,716	5.9%
One or more parts of the county	19,585,761	68.6%	5,893,340	70.9%	25,479,101	69.1%
The whole county	7,258,145	25.4%	1,977,179	23.8%	9,235,324	25.0%
County-level SDI by Q <sup>c</sup>						
Q1 (-2.14 to -0.95)	3,973,905	13.9%	1,207,518	14.5%	5,181,423	14.1%
Q2 (-0.95 to -0.20)	6,077,535	21.3%	1,734,719	20.9%	7,812,254	21.2%
Q3 (-0.20 to 0.53)	7,634,593	26.7%	2,115,399	25.4%	9,749,992	26.4%
Q4 (0.53-2.16)	10,877,620	38.1%	3,255,852	39.2%	14,133,472	38.3%

AIAN, American Indian and Alaska Native; NH, non-Hispanic; Q, quartile; SDI, Social Deprivation Index.

<sup>a</sup>Information extracted from 2020 and 2021 Area Health Resources Files. Year-specific county-level measures were linked for individuals identified in 2016-2020.<sup>34</sup>

<sup>b</sup>Defined based on 2013 Rural-Urban Continuum Codes. Metropolitan includes codes 1, 2, and 3; nonmetropolitan urban includes codes 4, 5, 6, and 7; rural includes codes 8 and 9.<sup>35</sup>

<sup>c</sup>SDI generated based on American Community Survey data. Year-specific SDIs were available from 2016-2019. Year-specific SDI was linked for individuals identified in 2016-2019. SDI from 2019 was used to link with individuals identified in 2020.<sup>36</sup>

# CLINICAL

**TABLE 2.** Telemental Health Use and Changes in Use From Pre-COVID-19 (2016-2019) to Early COVID-19 (2020) Among Publicly Insured Children<sup>34-36</sup>

Characteristics	Unadjusted telemental health use, 2016-2019, %	Unadjusted telemental health use, 2020, %	Unadjusted absolute difference, % (95% CI)	Adjusted absolute difference, <sup>a</sup> % (95% CI)	Difference in adjusted absolute difference, <sup>b</sup> %	P <sup>c</sup>
Overall	2.74	35.90	33.16 [33.14-33.18]	33.23 [33.21-33.25]		
Age group						
3-5 years	1.22	32.19	30.97 [30.92-31.01]	30.97 [30.92-31.01]	Reference	
6-11 years	2.84	41.14	38.30 [38.27-38.34]	38.32 [38.29-38.36]	7.31	<.0001
12-17 years	3.22	32.93	29.72 [29.68-29.75]	29.79 [29.76-29.82]	-1.20	<.0001
Sex						
Male	2.79	36.86	34.06 [34.04-34.09]	34.15 [34.12-34.18]	Reference	
Female	2.66	34.69	32.03 [32.00-32.06]	32.04 [32.01-32.08]	-2.03	<.0001
Race and ethnicity						
NH White	3.41	39.92	36.52 [36.48-36.55]	36.49 [36.45-36.52]	Reference	
NH Black	2.50	33.59	31.10 [31.05-31.14]	31.20 [31.15-31.25]	-5.39	<.0001
Hispanic	1.84	32.07	30.23 [30.19-30.27]	30.40 [30.36-30.44]	-6.19	<.0001
NH AIAN	3.81	40.72	36.91 [36.71-37.10]	36.85 [36.66-37.05]	0.42	<.0001
NH Asian	0.92	21.91	21.00 [20.88-21.11]	21.17 [21.06-21.29]	-15.45	<.0001
NH Pacific Islander	1.88	26.04	24.16 [23.83-24.50]	24.80 [24.47-25.14]	-12.10	<.0001
NH multirace	2.86	38.17	35.31 [34.98-35.64]	35.39 [35.06-35.73]	-1.39	<.0001
Missing	2.86	36.06	33.21 [33.16-33.25]	33.20 [33.15-33.25]	-3.27	<.0001
County-level percent NH Black population by Q <sup>d</sup>						
Q1 [0.00%-0.71%]	4.15	40.74	36.59 [36.50-36.69]	36.40 [36.31-36.50]	Reference	
Q2 [0.71%-2.22%]	3.39	38.77	35.38 [35.32-35.44]	35.19 [35.13-35.25]	-1.13	<.0001
Q3 [2.22%-10.17%]	3.23	37.88	34.65 [34.61-34.69]	34.63 [34.59-34.66]	-1.75	<.0001
Q4 [10.17%-85.87%]	1.98	32.97	30.98 [30.96-31.01]	31.11 [31.09-31.14]	-5.32	<.0001
County-level percent Hispanic population by Q <sup>d</sup>						
Q1 [0.50%-2.39%]	4.08	39.47	35.38 [35.31-35.46]	35.16 [35.09-35.24]	Reference	
Q2 [2.39%-4.37%]	3.40	39.19	35.78 [35.72-35.85]	35.70 [35.64-35.77]	0.53	<.0001
Q3 [4.37%-9.89%]	2.52	36.55	34.03 [33.99-34.07]	33.96 [33.92-34.00]	-1.22	<.0001
Q4 [9.89%-96.36%]	2.44	34.32	31.88 [31.85-31.91]	32.00 [31.98-32.03]	-3.22	<.0001
Metropolitan residency <sup>e</sup>						
Metropolitan	2.34	35.35	33.01 [32.98-33.03]	33.11 [33.09-33.13]	Reference	
Nonmetropolitan urban	4.53	38.43	33.90 [33.84-33.96]	33.78 [33.72-33.83]	0.71	<.0001
Rural	5.27	40.34	35.07 [34.88-35.25]	34.97 [34.78-35.15]	1.80	<.0001
Mental health professional shortage areas <sup>d</sup>						
None of the county	2.22	31.54	29.32 [29.24-29.40]	30.18 [30.09-30.26]	Reference	
One or more parts of the county	2.32	35.29	32.97 [32.94-32.99]	33.02 [32.99-33.04]	3.33	<.0001
The whole county	3.99	38.69	34.70 [34.65-34.74]	34.65 [34.61-34.70]	5.02	<.0001
County-level SDI by Q <sup>f</sup>						
Q1 [-2.14 to -0.95]	2.11	35.29	33.18 [33.12-33.23]	33.47 [33.42-33.53]	Reference	
Q2 [-0.95 to -0.20]	2.52	37.66	35.14 [35.10-35.19]	35.29 [35.25-35.34]	1.87	<.0001
Q3 [-0.20 to 0.53]	3.00	35.26	32.26 [32.22-32.30]	32.28 [32.24-32.32]	-1.16	<.0001
Q4 [0.53-2.16]	2.90	35.59	32.69 [32.66-32.72]	32.56 [32.53-32.60]	-0.89	<.0001

AIAN, American Indian and Alaska Native; NH, non-Hispanic; Q, quartile; SDI, Social Deprivation Index.

<sup>a</sup>From stratified regression models within corresponding subgroup controlling for all other variables listed in the table.

<sup>b</sup>Comparison of 2016-2019 vs 2020 trend across sociodemographic subgroups for adjusted absolute difference, controlling for all other variables listed in the table (eg, comparing the adjusted absolute difference between female and male).

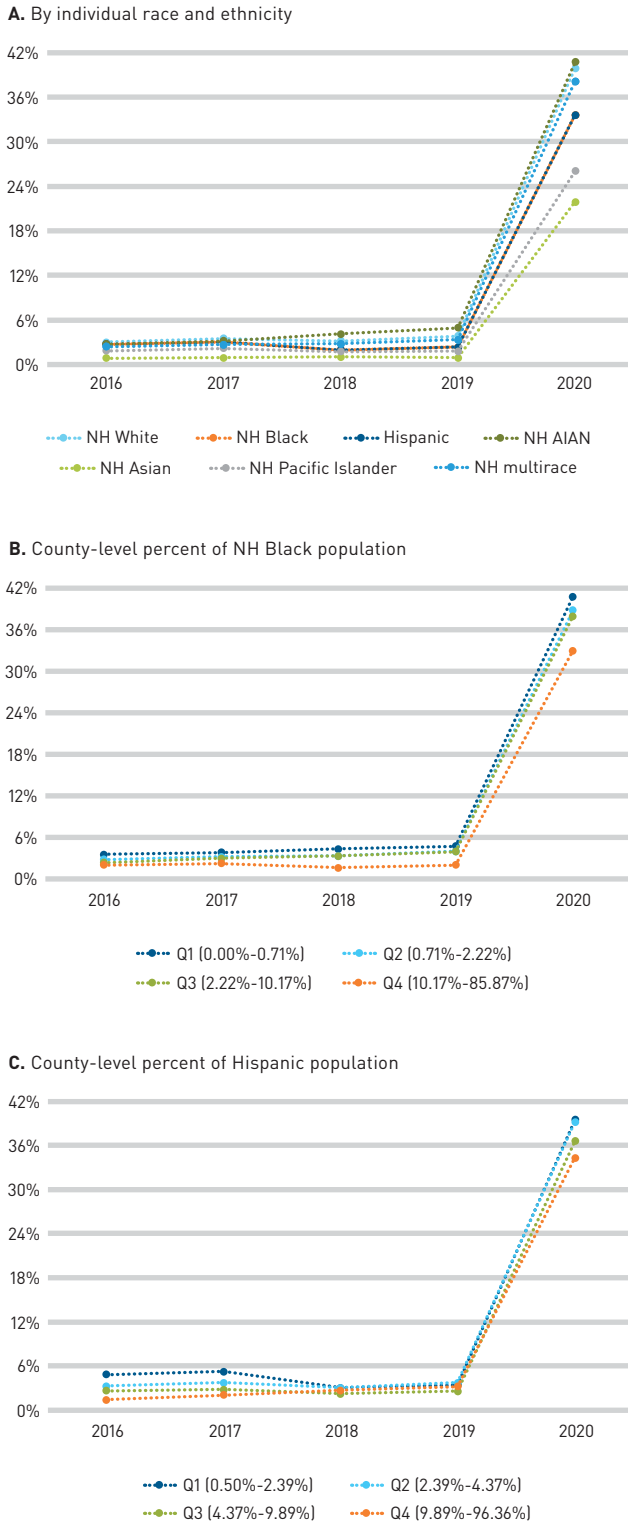
<sup>c</sup>P values estimated from models with interaction terms between each characteristic (eg, individual race and ethnicity) and the year indicator, adjusting for other study covariates.

<sup>d</sup>Information extracted from 2020 and 2021 Area Health Resources Files. Year-specific county-level measures were linked for individuals identified in 2016-2020.<sup>34</sup>

<sup>e</sup>Defined based on 2013 Rural-Urban Continuum Codes. Metropolitan includes codes 1, 2, and 3; nonmetropolitan urban includes codes 4, 5, 6, and 7; rural includes codes 8 and 9.<sup>35</sup>

<sup>f</sup>SDI generated based on American Community Survey data. Year-specific SDIs were available from 2016-2019. Year-specific SDI was linked for individuals identified in 2016-2019. SDI from 2019 was used to link with individuals identified in 2020.<sup>36</sup>

**FIGURE 1.** Receipt of Any Telemental Health Service(s) Among Publicly Insured Children With Mental Health–Related Encounters, 2016–2020



AIAN, American Indian and Alaska Native; NH, non-Hispanic; Q, quartile.

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(all  $P < .001$ ) than those in metropolitan areas (33.11 PP increase; 95% CI, 33.09–33.13) in adjusted models (Table 2).

Compared with children whose county was not an MH professional shortage area, those in a county designated as an MH professional shortage area had higher telemental health use pre-COVID-19 (3.99% vs 2.22%) and a 5.02 PP larger adjusted increase in 2020 ( $P < .001$ ) (Table 2).

**Sensitivity Analyses**

Sensitivity analysis restricted to beneficiaries in 23 states with higher-quality data showed consistent results (eAppendix Tables 6 and 7).

**DISCUSSION**

In this nationwide study of publicly insured children with MH-related encounters in 2016 to 2020, we observed a 12-fold relative increase in telemental health use following the onset of the COVID-19 pandemic in 2020. However, considerable disparities existed in telemental health use across racial and ethnic groups before the pandemic, which widened in 2020. This pattern was similar for individual-level racial and ethnic identity and county-level racial and ethnic composition. Children residing in nonmetropolitan areas and MH provider shortage areas were more likely to use telemental health pre-COVID-19 and had greater increases in its use during the pandemic.

Our findings highlight pronounced and widening child-level racial and ethnic disparities in telemental health utilization; NH Black and Hispanic children had lower baseline rates of and lower absolute increases in telemental health utilization following the pandemic onset. This aligns with the findings of prior studies documenting lower likelihoods of telehealth use among Black and Hispanic patients for MH and other health services among Medicaid and Medicare beneficiaries, privately insured patients, and patients treated at federally qualified health center clinics, both before and at the onset of COVID-19.<sup>27,39–41</sup> Notably, an issue brief by the Assistant Secretary for Planning and Evaluation (ASPE) found similarly lower telemental health use among children with racial and ethnic minority backgrounds compared with NH White children with Medicaid in 2019 to 2020.<sup>16</sup> We add to the current literature by estimating racial and ethnic disparities after adjusting for individual- and county-level confounders and by examining more granular racial and ethnic groups that have not been previously studied, including NH AIAN and NH Pacific Islander children. Our results revealed that absolute disparities in telemental health service utilization (relative to NH White children) were smallest for NH AIAN children and most pronounced for NH Asian children and NH Pacific Islander children before and during the COVID-19 pandemic. Moreover, the ASPE report measured the rate of telemental health use, which could be driven by both the percentage of children utilizing telemental health and the intensity of their use, whereas we examined the percentage of children with any telemental health use each year.

The pronounced racial and ethnic inequities in telemental health service use may stem from multifaceted reasons including caregivers' and/or children's preference for in-person engagement,<sup>42,43</sup> language barriers,<sup>44</sup> access to home broadband required for telemental health,<sup>45,46</sup> and historic mistrust in the MH system<sup>47</sup> among racial and ethnic minority groups. The absence of physical interaction from telemental health care visits, which help build patient-provider rapport, may have magnified mistrust concerns among racial and ethnic minority groups.<sup>48,49</sup> Given that telemental health continues to be a commonly used modality to deliver MH services to publicly insured children across many states,<sup>50</sup> the observed racial and ethnic disparities in telemental health utilization signal a need for future research to assess how these differences affect disparities in MH treatment access, engagement in services, and ultimately, MH outcomes.

Our study also reveals disparities in telemental health use at the community level. Specifically, Medicaid-enrolled children living in counties with higher percentages of Black and/or Hispanic residents were less likely to receive telemental health services than those in counties with the lowest quartile of Black and/or Hispanic residents, even after adjusting for individual-level race and ethnicity and other confounders. It is possible that MH providers serving communities with a higher percentage of Black and Hispanic residents had fewer resources, such as sufficient broadband infrastructures, and hence, were less able to pivot to telemental health as effectively as those in other communities.<sup>51,52</sup> This is consistent with prior research reporting that MH facilities located in counties with higher percentages of racial and ethnic minority groups were less likely to offer telehealth services.<sup>19,25</sup>

Interestingly, our findings also suggest that telehealth may be an effective tool to improve MH care access in other types of underserved communities, such as nonmetropolitan (vs metropolitan) areas and MH shortage (vs non-MH shortage) areas. Children in these areas were more likely to use telemental health before COVID-19 and experienced greater increases in telemental health use in 2020. These findings may be explained, in part, by the widespread adoption of telehealth payment policies by state Medicaid and CHIP programs in response to the COVID-19 public health emergency, which may have removed logistical barriers to accessing MH providers in person for residents of communities lacking local MH care infrastructure,<sup>25,40</sup> especially rural areas and regions with MH provider shortages.

### Limitations

Our study has limitations. First, administrative claims data may restrict our ability to identify all publicly insured children with MH care needs, particularly MH conditions that are undiagnosed or untreated. Second, we could not capture MH services not covered by Medicaid or CHIP, including school-based or self-paid MH services.<sup>53</sup> Third, given the state-based nature of Medicaid and CHIP programs, data quality may vary across states and years, including the reporting of race and ethnicity, diagnoses, and

procedures. To alleviate this limitation, we conducted sensitivity analyses among states with better data quality,<sup>38</sup> which yielded similar findings. Fourth, our selection criteria required only 1-month enrollment. Although requiring more months of enrollment may have ensured that we captured children's health care utilization comprehensively, our data showed that most children in our analytic sample (98%) with 1 month of enrollment also had 6 months of enrollment. We did not compare telemental health uptake between existing patients vs patients with a new MH concern, which may show different telemental health utilization patterns due to limited provider capacity to take on new patients and the focus on ensuring care continuity among those already engaged in MH care. Lastly, our analyses only include data through the end of 2020, so results may not be generalizable to more recent years. Our findings do, however, shed light on racial and ethnic inequities in telemental health use before the COVID-19 pandemic and following the onset of the pandemic. Telemental health utilization patterns may have evolved over time given the resumption of in-person work and school and regulatory changes in telehealth coverage. Additional research is needed to assess whether these inequities persisted.

## CONCLUSIONS

In this nationwide analysis of publicly insured children with MH-related encounters from 2016 to 2020, we observed a substantial increase in telemental health use with the onset of the COVID-19 pandemic. However, certain racial and ethnic minority groups and communities with high proportions of racial and ethnic minority populations had lower utilization of telemental health care pre-COVID-19 and smaller increases following the onset of COVID-19. Encouragingly, use and increases in use of telemental health were greater for residents of MH provider shortage areas and in rural regions. Together, our findings underscore the importance of continued coverage and monitoring of telemental health use by state Medicaid and CHIP programs beyond COVID-19 to ensure equitable access to telemental health among children in need of MH care. ■

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## **Supplemental Online Content**

**eAppendix Table 1. County-Level Study Covariates and Data Sources**

**eAppendix Table 2. Mental Health Condition Diagnosis Codes**

**eAppendix Table 3. Procedure Codes to Identity Mental Health Services**

**eAppendix Table 4. States Included in the Study**

**eAppendix Figure. Sample Derivation Process**

**eAppendix Table 5. Telemental Health Identification**

**eAppendix Table 6. Sample Characteristics among Publicly Insured Children with Mental Health-Related Encounters among 23 States**

**eAppendix Table 7. Telemental Health Use and Changes in Use from pre-COVID (2016-19) to early COVID-19 (2020) among Publicly Insured Children in 23 States**

**eAppendix Table 1. County-Level Study Covariates and Data Sources**

County-Level Measures	Data file	Year of Data	Source
Percentage non-Hispanic Black Population	Area Health Resources Files	2016, 2017, 2018, 2019, 2020	<a href="https://data.hrsa.gov/topics/health-workforce/ahrf">https://data.hrsa.gov/topics/health-workforce/ahrf</a>
Percentage Hispanic Population	Area Health Resources Files	2016, 2017, 2018, 2019, 2020	<a href="https://data.hrsa.gov/topics/health-workforce/ahrf">https://data.hrsa.gov/topics/health-workforce/ahrf</a>
Mental Health Provider Shortage Area	Area Health Resources Files	2016, 2017, 2018, 2019, 2020	<a href="https://data.hrsa.gov/topics/health-workforce/ahrf">https://data.hrsa.gov/topics/health-workforce/ahrf</a>
Metropolitan Residency	2013 Rural-Urban Continuum Codes	2013	<a href="https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/">https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/</a>
Social Deprivation Index	Social Deprivation Index County File	2012-2016 (used for 2016 Medicaid enrollees), 2013-2017 (used for 2017 Medicaid enrollees), 2014-2018 (used for 2018 Medicaid enrollees), 2015-2019 (used for 2019-2020 Medicaid enrollees)	<a href="https://www.graham-center.org/rgc/maps-data-tools/sdi/social-deprivation-index.html">https://www.graham-center.org/rgc/maps-data-tools/sdi/social-deprivation-index.html</a>

**eAppendix Table 2. Mental Health Condition Diagnosis Codes**

Mental Health Conditions	Diagnosis Codes
Attention-deficit/hyperactivity disorder	ICD-9: 314.00, 314.01  ICD-10: F90.0, F90.1, F90.2, F90.8, F90.9
Anxiety disorder(s)	ICD-9: 313.21, 313.22, 300.00, 300.01, 300.02, 300.09, 300.20, 300.21, 300.22, 300.23, 300.29, 313.0, 293.84, 309.21, 313.23  ICD-10: F40.00, F40.01, F40.02, F40.10, F40.11, F40.210, F40.218, F40.220, F40.228, F40.230, F40.231, F40.232, F40.233, F40.240, F40.241, F40.242, F40.243, F40.248, F40.290, F40.291, F40.298, F40.8, F40.9, F41.0, F41.1, F41.3, F41.8, F41.9, F06.4, F93.0, F94.0
Autism spectrum disorder(s)	ICD-9: 299.00, 299.01  ICD-10: F84.5, F84.0
Depressive disorder(s)	ICD-9: 296.20, 296.21, 296.22, 296.23, 296.24, 296.25, 296.26, 296.30, 296.31, 296.32, 296.33, 296.34, 296.35, 296.36, 296.82, 300.4, 311  ICD-10: F06.31, F06.32, F32.0, F32.1, F32.2, F32.3, F32.4, F32.5, F32.81, F32.9, F33.0, F33.1, F33.2, F33.3, F33.40, F33.41, F33.42, F33.9, F34.1, F34.81, F32.89, F33.8, F32.8
Disruptive disorder(s)	ICD-9: 301.7, 312.00, 312.01, 312.02, 312.03, 312.10, 312.11, 312.12, 312.13, 312.20, 312.21, 312.22, 312.23, 312.30, 312.31, 312.32, 312.33, 312.34, 312.35, 312.39, 312.4, 312.8, 312.81, 312.82, 312.89, 312.9, 313.81  ICD-10: F60.2, F63.1, F63.2, F63.81, F63.89, F63.9, F91.0, F91.1, F91.2, F91.8, F91.9, F91.3

**eAppendix Table 2. Mental Health Condition Diagnosis Codes (Cont.)**

Mental Health Conditions	Diagnosis Codes
Obsessive-compulsive and related disorder(s)	ICD-9: 300.3  ICD-10: F63.3, F42, F42.2, F42.3, F42.8, F42.9, F42.4
Trauma & stressor disorder(s)	ICD-9: 309.0, 309.22, 309.23, 309.24, 309.28, 309.29, 309.3, 309.4, 309.82, 309.83, 309.89, 309.9, 309.1, 308.0, 308.1, 308.2, 308.3, 308.4, 308.9, 309.81  ICD-10: F43.0, F43.10, F43.11, F43.12, F43.20, F43.21, F43.22, F43.23, F43.24, F43.25, F43.29, F43.8, F43.9, F94.1, F94.2, R45.7
Eating disorder(s)	ICD-9: 307.1, 307.50, 307.51, 307.52, 307.53, 307.54, 307.59  ICD-10: F50.00, F50.01, F50.02, F50.2, F50.8, F50.81, F50.82, F50.89, F50.9, F98.21, F98.29, F98.3
Schizophrenia and other psychotic disorder(s)	ICD-9: 293.81, 293.82, 295.00, 295.01, 295.02, 295.03, 295.04, 295.0, 295.10, 295.11, 295.12, 295.13, 295.14, 295.15, 295.20, 295.21, 295.22, 295.23, 295.24, 295.25, 295.30, 295.31, 295.32, 295.33, 295.34, 295.35, 295.40, 295.41, 295.42, 295.43, 295.44, 295.45, 295.50, 295.51, 295.52, 295.53, 295.54, 295.55, 295.60, 295.61, 295.62, 295.63, 295.64, 295.65, 295.70, 295.71, 295.72, 295.73, 295.74, 295.75, 295.80, 295.81, 295.82, 295.83, 295.84, 295.85, 295.90, 295.91, 295.92, 295.93, 295.94, 295.95, 296.90, 296.99, 297.0, 297.1, 297.2, 297.3, 297.8, 297.9, 298.0, 298.1, 298.2, 298.3, 298.4, 298.8, 298.9, 301.22  ICD-10: F06.0, F06.2, F20.0, F20.1, F20.2, F20.3, F20.5, F20.81, F20.89, F20.9, F21, F22, F23, F24, F25.0, F25.1, F25.8, F25.9, F28, F29, F60.1

**eAppendix Table 2. Mental Health Condition Diagnosis Codes (Cont.)**

Mental Health Conditions	Diagnosis Codes
Bipolar disorder	<p>ICD-9: 296.00, 296.01, 296.02, 296.03, 296.04, 296.05, 296.06, 296.10, 296.11, 296.12, 296.13, 296.14, 296.15, 296.16, 296.40, 296.41, 296.42, 296.43, 296.44, 296.45, 296.46, 296.50, 296.51, 296.52, 296.53, 296.54, 296.55, 296.56, 296.60, 296.61, 296.62, 296.63, 296.64, 296.65, 296.66, 296.7, 296.80, 296.81, 296.89</p> <p>ICD-10: F06.33, F06.34, F30.10, F30.11, F30.12, F30.13, F30.2, F30.3, F30.4, F30.8, F30.9, F31.0, F31.10, F31.11, F31.12, F31.13, F31.2, F31.30, F31.31, F31.32, F31.4, F31.5, F31.60, F31.61, F31.62, F31.63, F31.64, F31.70, F31.71, F31.72, F31.73, F31.74, F31.75, F31.76, F31.77, F31.78, F31.81, F31.89, F31.9, F34.0</p>
Personality disorder(s)	<p>ICD-9: 301.0, 301.10, 301.11, 301.12, 301.13, 301.20, 301.21, 301.3, 301.4, 301.50, 301.51, 301.59, 301.6, 301.81, 301.82, 301.83, 301.84, 301.89, 301.9</p> <p>ICD-10: F60.0, F60.4, F60.5, F60.6, F60.7, F60.81, F60.89, F60.9, F69, F60.3</p>
Other neuro-developmental disorder(s)	<p>ICD-9: 299.10, 299.11, 299.80, 299.81, 299.90, 299.91, 307.0, 307.20, 307.21, 307.22, 307.23, 307.3, 314.1, 314.2, 314.8, 314.9, 315.00, 315.01, 315.02, 315.09, 315.1, 315.2, 315.31, 315.32, 315.34, 315.35, 315.39, 315.4, 315.5, 315.8, 315.9, 317, 318.0, 318.1, 318.2, 319</p> <p>ICD-10: F70, F71, F72, F73, F78, F79, F80.0, F80.1, F80.2, F80.4, F80.81, F80.82, F80.89, F80.9, F81.0, F81.2, F81.81, F81.89, F81.9, F82, F84.3, F84.8, F84.9, F84.2, F88, F89, F95.0, F95.1, F95.2, F95.8, F95.9, F98.4, F98.5, R48.0, R41.83</p>
Other mental health disorder(s)	<p>ICD-9: 293.83, 300.5, 300.89, 300.9, 313.1, 313.82, 313.83, 307.9, 307.6, 307.7, 313.89, 313.9</p> <p>ICD-10: F06.30, F34.8, F34.89, F34.9, F39, F48.8, F48.9, F64.2, F93.8, F93.9, F94.8, F94.9, F98.0, F98.1, F98.8, F98.9</p>

**eAppendix Table 3. Procedure Codes to Identity Mental Health Services**

Type of Service	Procedure Codes
Applied behavior analysis	0359T, 0360T, 0361T, 0362T, 0363T, 0364T, 0365T, 0366T, 0367T, 0368T, 0369T, 0370T, 0371T, 0372T, 0373T, 0374T, 97153, 97154, 97155, 97156, 97157, 97158
Psychosocial intervention	90804, 90805, 90806, 90807, 90808, 90809, 90810, 90811, 90812, 90813, 90814, 90815, 90833, 90838, 90862, 90863, 90832, 90834, 90836, 90837, 90839, 90840, 90845, 90846, 90847, 90849, 90853, 90857, 90875, 90876, 96153, 96164, 96165, 96152, 96154, 96155, 96158, 96159, 96167, 96168, 96170, 96171, 99354, 99355, 99510, G0410, G0411, H0004, H2012, H2033
Medication management	90792, M0064
Mental health assessment	90791, 90801, 90802, 96127, 96150, 96151, 96156, 96160, 96161, 97151, 97152, G0444, H0031
Neuropsychological & psychological testing	96100, 96101, 96102, 96103, 96116, 96117, 96118, 96119, 96120, 96121, 96125, 96130, 96131, 96132, 96133, 96136, 96137, 96138, 96139, 96146
Other mental health intervention	90880, 97533, G0409, G0469, G0470, G0515, H0036, H0037, H0046, H2014, H2015, H2016, H2017, H2018, H2019, H2020, H2021, H2022, H2027, H2030, H2031, H2032, S9480, S9484, S9485, T1027

**eAppendix Table 4. States Included in the Study**

<b>State</b>	<b>Included in Primary Analyses</b>	<b>Included in Sensitivity Analyses<sup>a</sup></b>
Alabama	Yes	—
Alaska	Yes	Yes
Arizona	Yes	—
Arkansas	Yes	—
California	Yes	Yes
Colorado	Yes	—
Connecticut	Yes	—
Delaware	Yes	Yes
Florida	Yes	—
Georgia	Yes	Yes
Hawaii	Yes	—
Idaho	Yes	Yes
Illinois	Yes	Yes
Indiana	Yes	Yes
Iowa	Yes	—
Kansas	Yes	—
Kentucky	Yes	Yes
Louisiana	Yes	—
Maine	Yes	Yes
Maryland	Yes	—
Massachusetts	Yes	—
Michigan	Yes	—
Minnesota	Yes	—
Mississippi	Yes	—
Missouri	Yes	—
Montana	Yes	—
Nebraska	Yes	—
Nevada	Yes	Yes
New Hampshire	Yes	Yes
New Jersey	Yes	—
New Mexico	Yes	Yes
New York	Yes	—
North Carolina	Yes	Yes
North Dakota	Yes	Yes
Ohio	Yes	Yes
Oklahoma	Yes	Yes
Oregon	Yes	—
Pennsylvania	Yes	Yes
Rhode Island	Yes	—
South Carolina	Yes	—
South Dakota	Yes	Yes
Tennessee	Yes	—
Texas	Yes	Yes

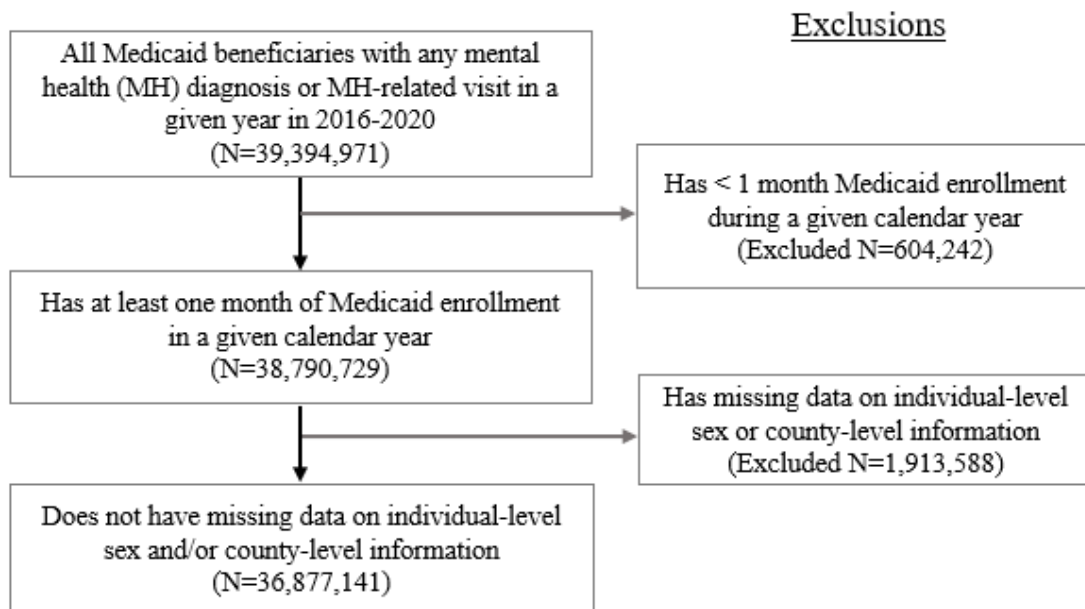
**eAppendix Table 4. States Included in the Study (Cont.)**

<b>State</b>	<b>Included in Primary Analyses</b>	<b>Included in Sensitivity Analyses<sup>a</sup></b>
Utah	Yes	—
Vermont	Yes	Yes
Virginia	Yes	Yes
Washington	Yes	Yes
West Virginia	Yes	—
Wisconsin	Yes	Yes
Wyoming	Yes	—

**Note:** <sup>a</sup>23 states included in the sensitivity analysis did not have high data quality concerns in data files that capture key study measures (i.e., outpatient care and race/ethnicity)



**eAppendix Figure 1. Sample Derivation Process (Primary Analytic Sample)**



**eAppendix Table 5. Telemental Health Identification**

<b>Code Type</b>	<b>Codes</b>
Place of Service	02
Modifiers	GT, GQ, 95
Procedure Codes	G0425, G0426, G0427, G0406, G0407, G0408, G0459, G0508, G0509, 0188T, 0189T, 98966, 98967, 98968, 99441, 99442, 99443

**eAppendix Table 6. Sample Characteristics among Publicly Insured Children with Mental Health-Related Encounters living in 23 States (n=20,608,557)**

	2016-2019		2020		Total	
	N	Col %	N	Col %	N	Col %
Total	16053362	100.0%	4555195	100.0%	20608557	100.0%
Age groups						
3-5 years	2613311	16.3%	708878	15.6%	3322189	16.1%
6-11 years	6429132	40.0%	1672932	36.7%	8102064	39.3%
12-17 years	7010919	43.7%	2173385	47.7%	9184304	44.6%
Sex						
Male	9243536	57.6%	2530253	55.5%	11773789	57.1%
Female	6809826	42.4%	2024942	44.5%	8834768	42.9%
Race and Ethnicity						
Non-Hispanic White	6529349	40.7%	1823121	40.0%	8352470	40.5%
Non-Hispanic Black	2897582	18.0%	805825	17.7%	3703407	18.0%
Hispanic	4706151	29.3%	1375884	30.2%	6082035	29.5%
Non-Hispanic AIAN	254137	1.6%	57306	1.3%	311443	1.5%
Non-Hispanic Asian	313793	2.0%	103735	2.3%	417528	2.0%
Non-Hispanic Pacific Islander	49478	0.3%	14198	0.3%	63676	0.3%
Non-Hispanic Multi-race	89734	0.6%	52474	1.2%	142208	0.7%
Missing on race/ethnicity	1213138	7.6%	322652	7.1%	1535790	7.5%
County-level Percent non-Hispanic Black Population <sup>1</sup> , Quartiles						
Q1 (0.00%, 0.71%)	1092721	6.8%	273604	6.0%	1366325	6.6%
Q2 (0.71%, 2.22%)	2459118	15.3%	695782	15.3%	3154900	15.3%
Q3 (2.22%, 10.17%)	6166845	38.4%	1788430	39.3%	7955275	38.6%
Q4 (10.17%, 85.87%)	6334678	39.5%	1797379	39.5%	8132057	39.5%
County-level Percent Hispanic Population <sup>1</sup> , Quartiles						
Q1 (0.50%, 2.39%)	1694635	10.6%	411805	9.0%	2106440	10.2%
Q2 (2.39%, 4.37%)	1548349	9.6%	413813	9.1%	1962162	9.5%
Q3 (4.37%, 9.89%)	3529158	22.0%	1004732	22.1%	4533890	22.0%
Q4 (9.89%, 96.36%)	9281220	57.8%	2724845	59.8%	12006065	58.3%
County-level Metro Status <sup>2</sup>						
Metropolitan	13202018	82.2%	3777760	82.9%	16979778	82.4%
Non-metropolitan Urban	2579721	16.1%	704427	15.5%	3284148	15.9%
Rural	271623	1.7%	73008	1.6%	344631	1.7%
Mental Health Shortage Areas <sup>1</sup>						
None of the county	1183729	7.4%	243406	5.3%	1427135	6.9%
One or more parts of the county	10805288	67.3%	3124523	68.6%	13929811	67.6%
The whole county	4064345	25.3%	1187266	26.1%	5251611	25.5%
County-level SDI <sup>3</sup> , Quartiles						
Q1 (-2.14, -0.95)	1962060	12.2%	583160	12.8%	2545220	12.4%
Q2 (-0.95, -0.20)	3171946	19.8%	850146	18.7%	4022092	19.5%
Q3 (-0.20, 0.53)	3979272	24.8%	1109056	24.3%	5088328	24.7%
Q4 (0.53, 2.16)	6940084	43.2%	2012833	44.2%	8952917	43.4%

\* Notes: Abbreviation: AIAN = American Indian and Alaska Native. SDI = Social Deprivation Index; 23 states included in the sensitivity analysis did not have high data quality concerns in data files that capture key study measures (i.e., outpatient care and race/ethnicity)

<sup>1</sup> Information extracted from 2020 and 2021 Area Health Resources Files. Year-specific county-level measures were linked for individuals identified in 2016-2020. Data available from: <https://data.hrsa.gov/topics/health-workforce/ahrf>

<sup>2</sup> Defined based on 2013 Rural-Urban Continuum Codes. Metro includes codes 1, 2, 3; Non-metro Urban includes codes 4, 5, 6, 7; Rural includes code 8, 9. For detailed documentation for each code, see: <https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/documentation/>

<sup>3</sup> Social deprivation index (SDI) generated based on American Community Survey data. Year-specific SDIs were available from 2016-2019. Year-specific SDI was linked for individuals identified in 2016-2019. SDI from 2019 was used to link with individuals identified in 2020. Data available from: <https://www.graham-center.org/maps-data-tools/social-deprivation-index.html>

**eAppendix Table 7. Telemental Health Use and Changes in Use from pre-COVID (2016-19) to early COVID-19 (2020) among Publicly Insured Children in 23 States**

	Unadjusted Telemental Health Use 2016-2019, %	Unadjusted Telemental Health Use 2020, %	Unadjusted Absolute Difference, %	95% CI	Adjusted Absolute Difference <sup>4</sup> , %	95% CI	Difference in Adjusted Absolute Difference <sup>5</sup> , %	P-value <sup>6</sup>
Overall	2.89	35.90	33.02	(32.99, 33.04)	33.13	(33.10, 33.16)		
Age Group								
3-5 years	1.27	34.00	32.73	(32.67, 32.79)	32.76	(32.69, 32.82)	Reference	
6-11 years	3.03	42.06	39.03	(38.98, 39.08)	39.08	(39.03, 39.13)	6.28	<.0001
12-17 years	3.36	31.78	28.42	(28.38, 28.47)	28.54	(28.50, 28.58)	-4.24	<.0001
Sex								
Male	2.93	37.10	34.17	(34.14, 34.21)	34.30	(34.27, 34.34)	Reference	
Female	2.83	34.40	31.57	(31.53, 31.62)	31.64	(31.60, 31.68)	-2.59	<.0001
Race and Ethnicity								
Non-Hispanic White	3.46	39.64	36.18	(36.13, 36.23)	36.19	(36.14, 36.23)	Reference	
Non-Hispanic Black	3.23	33.90	30.67	(30.61, 30.74)	30.83	(30.76, 30.89)	-5.46	<.0001
Hispanic	1.91	31.96	30.05	(30.00, 30.10)	30.18	(30.13, 30.23)	-6.11	<.0001
Non-Hispanic AIAN	3.17	39.11	35.95	(35.71, 36.18)	35.95	(35.71, 36.19)	-0.29	0.020
Non-Hispanic ASIAN	0.89	24.52	23.63	(23.47, 23.79)	23.65	(23.49, 23.81)	-12.58	<.0001
Non-Hispanic Pacific Islander	1.80	28.08	26.28	(25.83, 26.73)	26.49	(26.03, 26.94)	-9.89	<.0001
Non-Hispanic Multi-race	2.79	37.18	34.38	(34.04, 34.73)	34.45	(34.10, 34.80)	-1.99	<.0001
Missing	3.31	39.85	36.55	(36.44, 36.65)	36.76	(36.65, 36.86)	0.39	<.0001
County-level Percent Non-Hispanic Black Population <sup>1</sup> , Quartiles								
Q1 (0.00%, 0.71%)	3.89	40.51	36.62	(36.50, 36.73)	36.59	(36.48, 36.71)	Reference	
Q2 (0.71%, 2.22%)	3.00	36.84	33.84	(33.77, 33.92)	33.83	(33.75, 33.90)	-2.76	<.0001
Q3 (2.22%, 10.17%)	2.67	37.19	34.52	(34.48, 34.57)	34.63	(34.58, 34.67)	-2.02	<.0001
Q4 (10.17%, 85.87%)	2.88	33.56	30.67	(30.63, 30.72)	30.88	(30.83, 30.92)	-5.84	<.0001
County-level Percent Hispanic Population <sup>1</sup> , Quartiles								
Q1 (0.50%, 2.39%)	4.60	39.00	34.41	(34.31, 34.51)	34.11	(34.01, 34.20)	Reference	
Q2 (2.39%, 4.37%)	4.03	40.54	36.51	(36.41, 36.61)	36.62	(36.52, 36.71)	2.31	<.0001
Q3 (4.37%, 9.89%)	3.35	36.65	33.30	(33.24, 33.36)	33.35	(33.29, 33.42)	-0.97	<.0001
Q4 (9.89%, 96.36%)	2.21	34.45	32.25	(32.21, 32.28)	32.33	(32.29, 32.36)	-1.95	<.0001
Metro residency <sup>2</sup>								
Metro	2.47	35.39	32.92	(32.89, 32.95)	33.06	(33.03, 33.09)	Reference	
Non-metro Urban	4.79	38.29	33.50	(33.42, 33.58)	33.38	(33.30, 33.46)	0.46	<.0001
Rural	5.03	39.25	34.22	(33.98, 34.46)	34.01	(33.76, 34.25)	1.07	<.0001
Mental Health Shortage Areas <sup>1</sup>								
None of the county	2.55	34.30	31.76	(31.65, 31.86)	31.92	(31.81, 32.02)	Reference	
One or more parts of the county	2.44	35.16	32.72	(32.69, 32.76)	32.87	(32.84, 32.91)	0.87	<.0001
The whole county	4.17	38.17	34.00	(33.94, 34.06)	34.07	(34.01, 34.13)	2.13	<.0001

**eAppendix Table 7 (Cont.). Telemental Health Use and Changes in Use from pre-COVID (2016-19) to early COVID-19 (2020) among Publicly Insured Children in 23 States**

	Unadjusted Telemental Health Use 2016-2019, %	Unadjusted Telemental Health Use 2020, %	Unadjusted Absolute Difference, %	95% CI	Adjusted Absolute Difference <sup>4</sup> , %	95% CI	Difference in Adjusted Absolute Difference <sup>5</sup> , %	P-value <sup>6</sup>
County-level SDI <sup>3</sup> , Quartiles								
Q1 (-2.14, -0.95)	2.27	35.78	33.51	(33.43, 33.58)	33.83	(33.75, 33.90)	Reference	
Q2 (-0.95, -0.20)	3.05	37.39	34.34	(34.27, 34.40)	34.43	(34.37, 34.50)	0.72	<.0001
Q3 (-0.20, 0.53)	2.69	33.97	31.28	(31.23, 31.34)	31.48	(31.43, 31.54)	-2.42	<.0001
Q4 (0.53, 2.16)	3.10	36.38	33.28	(33.23, 33.32)	33.34	(33.30, 33.38)	-0.54	<.0001

\* *Notes:* Abbreviation: AIAN = American Indian and Alaska Native. SDI = Social Deprivation Index; n=20,608,557 child-year observations in 23 states that did not have high data quality concerns on files that capture key study measures (including outpatient care and race/ethnicity).

<sup>1</sup> Information extracted from 2020 and 2021 Area Health Resources Files. Year-specific county-level measures were linked for individuals identified in 2016-2020. Data available from: <https://data.hrsa.gov/topics/health-workforce/ahrf>

<sup>2</sup> Defined based on 2013 Rural-Urban Continuum Codes. Metro includes codes 1, 2, 3; Non-metro Urban includes codes 4, 5, 6, 7; Rural includes code 8, 9. For detailed documentation for each code, see: <https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/documentation/>

<sup>3</sup> Social deprivation index (SDI) generated based on American Community Survey data. Year-specific SDIs were available from 2016-2019. Year-specific SDI was linked for individuals identified in 2016-2019. SDI from 2019 was used to link with individuals identified in 2020. Data available from: <https://www.graham-center.org/maps-data-tools/social-deprivation-index.html>

<sup>4</sup> Adjusted models controlled for all variables listed in the table.

<sup>5</sup> Comparison of 2016-2019 vs. 2020 trend across sociodemographic subgroups for adjusted absolute difference, controlling for all other variables listed in the table. For example, comparing the adjusted absolute difference between Female and Male.