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US Eating Disorder Treatment Deserts and Childhood Opportunity Pre- and Post- COVID-19 Pandemic

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ABSTRACT

Background: The prevalence of youth with eating disorders has risen since the COVID-19 pandemic, yet fewer than half of those diagnosed with an eating disorder access care. Disparities in treatment access persist along racial, ethnic, socioeconomic, and geographic lines, but the impact of the pandemic on these disparities is not well understood. We examined pediatric eating disorder treatment access pre- and post-pandemic and assessed whether childhood opportunity predicts access.

Methods: Eating disorder treatment centers were compared in 2019 versus 2023 to assess geographic (physical) and circumstantial (identity, illness severity, or SES-based) treatment access, analyzing associations with the Childhood Opportunity Index. Eating disorder treatment centers were identified via two databases and classified as in-person or virtual. ZIP codes and child opportunity data were mapped. Treatment centers were categorized by care level, population served, insurance accepted, and services offered.

Results: In 2019, 29.7% of US youth lived in geographic treatment deserts, decreasing to 28.7% in 2023 ($p < .001$), indicating that more youth gained access to treatment between timepoints. Youth with public insurance, younger age, or higher acuity needs had larger circumstantial treatment deserts. Numerous states had few/no treatment options, although virtual care centers emerged, filling some gaps. Youth in low/moderate Childhood Opportunity Index areas were less likely to have access to treatment (odds ratio [OR], 0.55; 95% CI, 0.42–0.73) compared to high-opportunity areas.

Conclusions: Disparities in eating disorder care access persisted after the COVID-19 pandemic, disproportionately affecting rural and low-Childhood Opportunity Index areas. While the total number of centers increased, this did not match increases in eating disorder prevalence since the pandemic onset. The introduction of virtual care models emerged, meeting some needs, though virtual care is not a viable option for many youth. Findings underscore the need for interventions to align treatment availability with demand and ensure equitable access.

Keywords: eating disorder, healthcare access, health equity, childhood opportunity, geospatial analysis

PLAIN ENGLISH SUMMARY

Eating disorder prevalence has risen since the onset of the COVID-19 pandemic, but fewer than half of those diagnosed with an eating disorder access care. We know that children with marginalized identities, from rural areas, and those with lower socio-economic status have a harder time accessing care. However, we do not yet know whether or how the COVID-19 pandemic impacted these already-existing disparities. In this study, we examined all eating disorder treatment facilities in the United States before and after the initial onset of the COVID-19 pandemic. We then evaluated the relationship between treatment 'deserts' (areas where little or no treatment exists) and child opportunity, a metric used to measure neighborhood conditions and their influence on youths' health and development. We found that the number of eating disorder treatment centers increased throughout the pandemic, but not enough to offset the increase in eating disorder diagnoses. New virtual care programs may help give some children access to treatment, but virtual care is not adequate for everyone. Substantial treatment deserts exist in the United States, and that those treatment deserts unequally impact younger or

medically complex children, children with public insurance, or children living in lower opportunity areas.

DECLARATIONS

Ethics approval and consent to participate: Not applicable

Consent for publication: Not applicable

Availability of data and materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Authors' Contributions: Dr. Samantha Turner and Dr. Rebecka Peebles conceptualized and designed the study, drafted the initial manuscript, and critically reviewed and revised the manuscript. Bradford Morris, Ella Cho, and Eric Chan designed the data collection instruments, collected data, carried out the initial analyses, and critically reviewed and revised the manuscript. Mackenzie Duffy, Dr. Tracy Richmond, Dr. Jillian Lampert, Johanna Kandel, Dr. Nicole Siegfried, Dr. C. Alix Timko, and Dr. Molly Perlman critically reviewed and revised the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of this work.

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LIST OF ABBREVIATIONS

Abbreviation	Definition
ED	Eating disorder
HLOC	Higher level of care
GTD	Geographic treatment desert
CTD	Circumstantial treatment desert
US	United States
NG	Nasogastric
COI	Childhood Opportunity Index
OR	Odds ratio
LGBTQ+	Lesbian, gay, bisexual, transgender, queer/questioning, etc.

BACKGROUND

Patients with eating disorders (EDs) experience the second highest mortality of all psychiatric disorders, elevated health care costs, and poor quality of life.[1] EDs typically onset during adolescence[3] and are more effectively treated with prompt intervention, making access to care for youth paramount.[4,5] Evidence-based treatment involves multidisciplinary teams including psychiatry, psychology, nutrition, and often more providers across multiple levels of care. Levels of care exist on a spectrum: outpatient is least structured (weekly/monthly visits), followed by intensive outpatient (10-20 hours/week, 3-4 days/week), and then partial hospitalization (20-40 hours/week, 5-6 days/week). The most structured, or highest levels of care (HLOC) are residential treatment centers, short-term inpatient medical stabilization units, and inpatient psychiatric programs. These offer varying levels of support; short-term inpatient medical stabilization focuses mainly on restoration of normal physiology, while inpatient psychiatric programs focus on de-escalating crises and avoiding imminent harm.

Although treatment yields better outcomes, few youths with an ED seek care.[1] Moreover, evidence-based care is challenging to obtain and use.[6,7] "Treatment deserts," or areas where no treatment exists that meets one's need, serve as a barrier to care for individuals seeking treatment. Geographic treatment deserts (GTDs) are areas with limited or no ED treatment. In the United States (US), rural areas, where 14% of the population resides, have lower concentrations of mental health professionals compared to urban areas.[8] In the Southeast and Midwest US, GTDs exist for both mental and physical conditions.[9]

Even when geographic access exists, other factors limit patients' access to care, creating circumstantial treatment deserts (CTDs). Cost is a consistent barrier, as insurance coverage, especially Medicaid, varies by state and may not cover care at all levels.[6] Youth with public

insurance are one-third as likely to receive specialty ED care as those with private insurance.[12] Certain patients with EDs may face additional barriers to care because of age restrictions within facilities, non-acceptance of patients using nasogastric (NG) tubes, or identity.[13] LGBTQ+ individuals report less trust in physicians,[2] and transgender patients often view ED treatment negatively due to limited provider competence in gender-affirming care.[3]

The childhood-opportunity index (COI) is a data-driven metric that quantifies the likelihood that youth in a certain neighborhood have access to high-quality resources to promote optimal health and development.[10] Lower COI is linked to higher hospitalization rates[18] and acute care use,[19] worse cardiac surgical outcomes,[20] and greater risk of depression and suicide.[21]

The COVID-19 pandemic changed the way the world received medical care. ED treatment centers rapidly adopted virtual care during the pandemic,[14] but many patients still require in-person care, particularly if they exhibit unsafe behaviors or require in-person supervision.

The number of youths with ED symptoms, diagnoses, and hospitalizations have all increased since the pandemic's onset,[14] yet no study has assessed challenges in care access for youth with EDs pre- and post-pandemic. Our objectives were to: 1) describe changes in US ED treatment centers between 2019-2023, 2) assess shifts in treatment desert prevalence for youth, and 3) examine associations between childhood opportunity and ED treatment access. We hypothesized that treatment deserts would be more prevalent in 2023 than in 2019, and that low COI areas would be less likely to have ED treatment centers.

METHODS

Study Design

This cross-sectional study was determined to not meet criteria for human subjects research by the Committees for the Protection of Human Subjects at Children's Hospital of Philadelphia. The manuscript was prepared using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.[4]

Given that ED treatment accreditation bodies do not currently maintain all-inclusive lists of registered facilities available in the public domain, centers met inclusion criteria if they were found on either of the only two open access ED treatment search engines: findEDhelp.com and EDreferral.com. Google.com was also searched as a cross-check using the term "eating disorder treatment" followed by each US state. Centers not treating EDs were excluded.

We extracted the following variables for each center: program name, state, ZIP code, ED diagnoses treated, level(s) of care, ages treated, insurance/payor systems accepted, self-described LGBTQ+ friendly and/or gender inclusive status, interpreter service availability, and whether patients with NG tubes were accommodated. If a discrepancy existed between a database and the center's website, we defaulted to the center website. Variables were extracted in late 2019 and mid-2023. To better describe the treatment landscape post-pandemic, these variables were also collected on virtual-only treatment centers, though none were identified until the 2023 search. Therefore, virtual care programs were not included in primary analyses and are described separately.

Youth Treatment Deserts

Treatment center characteristics were described for all US centers caring for youth and/or adults; remaining analyses focused on treatment centers serving youth under age 18. ZIP codes with and without access to treatment centers (overall and with specified characteristics) were identified. The number of youths living in each ZIP code were then estimated and compared

between timepoints. ZIP code-level treatment desert prevalence was calculated using the National Bureau of Economic Research's ZIP Code Tabulation Area Database, an open-access database based on census data.[15] This database identifies all ZIP codes within a 50-mile great-circle distance. We classified each ZIP code as "having access" (≥1 treatment center with the characteristic within 50 miles) or "lacking access" (zero treatment centers with the specified characteristic within 50 miles, defining a "treatment desert").

Population-level prevalence was estimated using data from Diversity Data Kids, which uses Census Bureau data to estimate the number of youths in each ZIP code. As the most recent data were based on the 2020 Census and did not reflect the 2023 population, a growth factor of 1.3%, derived from US Forum on Child and Family Statistics estimates,[17] was applied to project youth population changes between 2019 and 2023. To ensure consistency despite slight changes in ZIP code boundaries over time, all analyses were conducted using 2020 ZIP code boundaries.

Changes in the prevalence of treatment deserts were assessed in two ways: by (1) comparing the number of ZIP codes with and without access in 2019 and 2023, and (2) estimating the number of youths with and without access in these years. The proportional changes of ZIP codes with and without access in 2019 and 2023 were calculated to determine percent change over time, and we used chi-square analyses to assess for statistically significant differences between groups and phi coefficients to measure effect size.

Child Opportunity

We quantified child opportunity using the Childhood Opportunity Index (COI) 2.0,[5] which measures 44 opportunity indicators within three different domains: education, health and environment, and social and economic. Each neighborhood (ZIP code and/or census tract) is scored based on these three domains and given a composite score (0–100). Scores are

categorized as very low, low, moderate, high, or very high levels of opportunity. We used the composite COI score and category for each ZIP code based on the most recent published census data and 2020 ZIP code boundaries. To determine the relationship between COI and treatment access, we conducted a binomial logistic regression.

Data Visualization and Analysis

We used Maptitude v2023.5550 to visually map treatment centers based on ZIP code and a variety of characteristics. COI was mapped based on numerical score and overlayed as a density (heat) map over treatment centers. All statistical analyses were performed in RStudio.

RESULTS

US ED Treatment Center Characteristics 2019 vs. 2023

Treatment site characteristics are described by year in Table 1. Overall, the raw number of treatment centers in the US increased by 10.1% from 2019 to 2023. In 2023, there was an overall increase of 7.6% of HLOC centers with residential treatment centers increasing by 12.7%, but inpatient medical stabilization and inpatient psychiatric programs decreased by 12.5% and 26.1% respectively. There was a 4.5% increase in the number of centers accepting Medicaid. Centers self-describing as gender-inclusive or LGBTQ+ friendly increased by 6.7% and 27.1%, respectively. Larger increases were observed in the number of centers accepting patients requiring NG feeds and those offering interpreter services, by 43.8% and 29.4% respectively. Geographically, the Midwest had the largest increase in treatment access, by 23.1%. The number of treatment centers in the Southeastern and Southwestern parts of the country decreased. In both 2019 and 2023, seven states had no treatment centers, nine states had no treatment centers for youth under 18, and sixteen had no treatment centers for youth under 13.

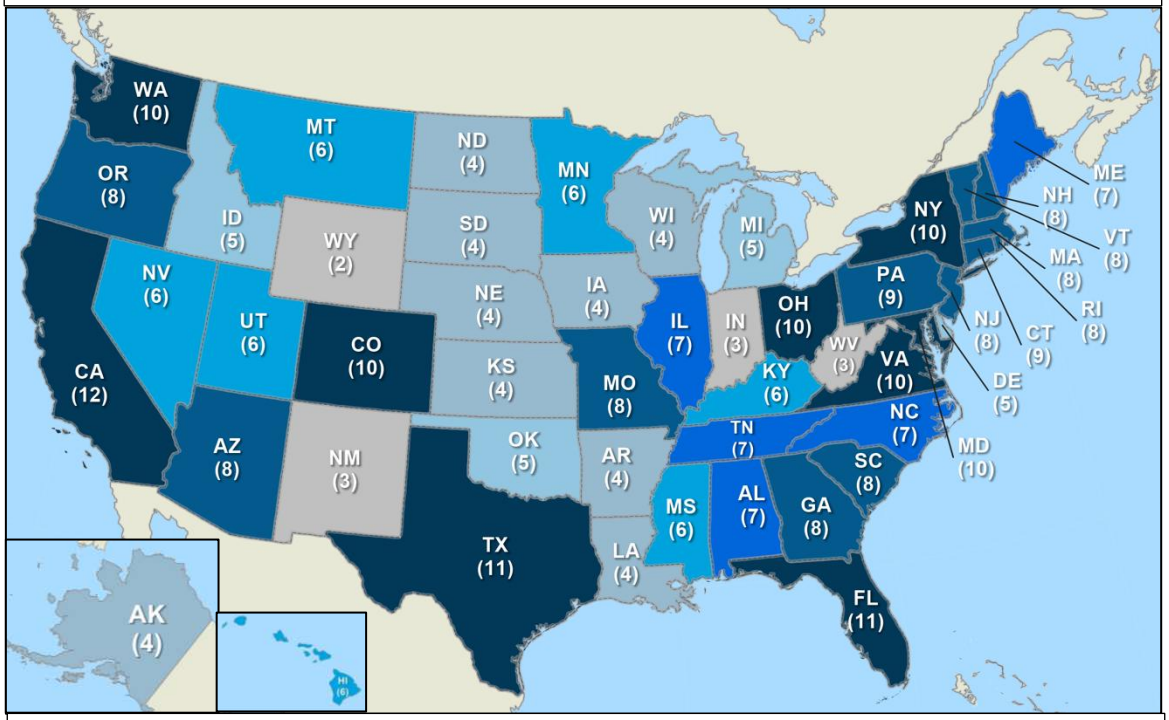
Table 1. Changes in Characteristics of In-Person ED Treatment Centers Between 2019 and 2023				
	2019 n (%)	**2023 n (%)**	**Raw Change (n)**	**Proportional Change (%)[a]**
Total Centers	375	413	+38	+10.1
Level of Care[b]				
Highest Levels of Care (HLOC)				
Medical Stabilization	63 (16.8)	61 (14.8)	–2	–11.9
Inpatient	52 (13.8)	42 (10.2)	–10	–26.1
Residential	115 (30.7)	143 (34.6)	+28	+12.7
Lower Levels of Care				
Partial Hospitalization	225 (60.0)	243 (58.8)	+18	–2.0
Intensive Outpatient	279 (74.4)	295 (71.4)	+16	–4.0
Diagnoses treated				
Anorexia nervosa	371 (98.9)	412 (99.8)	+41	+0.9
Bulimia nervosa	368 (98.1)	405 (98.1)	+37	0
Avoidant/restrictive food intake disorder	297 (79.2)	343 (83.1)	+46	+4.9
Binge eating disorder	340 (90.6)	383 (92.7)	+43	+2.3
Other specified feeding/eating disorder	332 (88.5)	346 (83.8)	+14	–5.3
Accepts under age 18	301 (80.3)	321 (77.7)	+20	–3.2
Accepts under age 13	151 (40.3)	164 (39.7)	+13	–1.5
Accepts Medicaid	126 (33.6)	145 (35.1)	+19	+4.5
Highest Levels of Care (HLOC)				
Medical Stabilization	52 (41.3)	54 (37.2)	+2	–9.9
Inpatient	25 (19.8)	27 (18.6)	+2	–6.1
Residential	19 (15.1)	33 (22.8)	+14	+51.0
Lower Levels of Care				
Partial Hospitalization	78 (61.9)	86 (59.3)	+8	–4.2
Intensive Outpatient	94 (74.6)	104 (71.7)	+10	–3.9
Reports being "gender inclusive" or similar	298 (79.4)	350 (84.7)	+52	+6.7
Reports "LGBTQ+ friendly" or similar	193 (51.4)	270 (65.3)	+77	+27.1
NG accommodating	60 (16.0)	95 (23.0)	+35	+43.8
Offers interpreter services	120 (32.0)	171 (41.4)	+51	+29.4
Geographic area				
Northeast	82 (21.8)	89 (21.5)	+7	–1.3
Midwest	65 (17.3)	88 (21.3)	+23	+23.1
Southeast	89 (23.7)	83 (20.1)	–6	–15.2
Southwest	36 (9.6)	35 (8.5)	–1	–11.5
West	103 (27.4)	118 (28.6)	+15	+4.4

[a] Proportional change between 2019 and 2023 was calculated by subtracting the % in 2019 from the % in 2023 and then dividing that result by the % in 2019 to allow for meaningful comparison despite variations in total sample size between 2019 and 2023.

[b] Centers offering multiple levels of care were counted in each category of care that they provide.

A total of 55 in-person ED care programs closed between 2019 and 2023, while 93 new in-person centers opened. Seventeen exclusively virtual programs opened, allowing virtual care access in all US states by 2023 (Figure 1). Virtual programs varied in their level of care: all offered intensive outpatient and 11 (64.7%) offered partial hospitalization. Eleven virtual programs (64.7%) treated youth under 18 and 6 (35.3%) treated youth under 13.

Figure 1. Virtual care centers, (N) in 2023



Note. This figure depicts the number of virtual care centers that provide care in each state, of the 17 that existed nationally in 2023. Darker shades indicate a greater number of centers.

In-Person ED Treatment Deserts for Youth 2019 vs. 2023

Table 2 outlines changes in treatment deserts for youth under 18 between timepoints. The first section captures the prevalence of GTDs by examining all youth-treating centers, and subsequent sections describe the prevalence of CTDs by examining common variables impacting treatment access. A majority (62.4%) of ZIP codes were located within a youth GTD in 2019; there was a 1.7% decrease in those ZIP codes without geographic access to treatment in 2023.

However, when examining the youth population within ZIP codes, most US youth lived within areas of treatment *access* in 2019 (51.6 million, 70.2%) and in 2023 (53.1 million, 71.2%). Still, in 2023, nearly 30% of US youth lacked access to ED treatment, over 35% were without HLOC access, and nearly 45% of those requiring NG tube feeds lacked access. While most comparisons showed statistically significant differences, phi coefficients revealed negligible differences, indicating little to no meaningful change between timepoints.

Table 2. Changes in Prevalence of Youth Treatment Deserts Between 2019 and 2023

All Centers Treating Youth					
	2019 (n, (%))	**2023 (n, (%))**	**Raw Change (n)**	**Proportional Change (%)**	**X^2 (φ)**
US ZIP Codes					9.9 (.01)***
With access to treatment	14,681 (37.6)	15,109 (38.7)[a]	+428	+2.9	
Without access to treatment	24,388 (62.4)	23,960 (61.3)[a]	–428	–1.7	
Estimated number of youth					19,155.9 (.01)***
With access to treatment	51,652,535 (70.2)	53,095,441 (71.2)[b]	+1,442,906	+1.4	
Without access to treatment	21,924,323 (29.7)	21,437,915 (28.7)[b]	–486,408	–3.4	
Higher Levels of Care (Inpatient and Residential Centers) Only That Treat Youth					
	2019 (n, (%))	**2023 (n, (%))**	**Raw Change (n)**	**Proportional Change (%)**	**X^2 (φ)**
US ZIP Codes					29.5 (.02)***
With access to treatment	12,186 (31.2)	12,895 (33.0)[a]	+709	+5.7	
Without access to treatment	26,883 (68.8)	26,174 (66.99)[a]	–709	–2.6	
Estimated number of youth					64,217.4 (.02)***
With access to treatment	46,205,275 (62.8)	48,297,614 (64.8)[b]	+2,092,339	+3.2	
Without access to treatment	27,371,582 (37.2)	26,235,741 (35.2)[b]	–1,135,841	–5.4	
Centers Accepting Medicaid That Treat Youth					
	2019 (n, (%))	**2023 (n, (%))**	**Raw Change (n)**	**Proportional Change (%)**	**X^2 (φ)**
US ZIP Codes					89.2 (.001)***
With access to treatment	11,947 (30.6)	12,810 (32.7)[a]	+863	+6.8	
Without access to treatment	27,122 (69.4)	26,259 (67.2)[a]	–863	–3.2	
Estimated number of youth					195,951.8 (.04)***
With access to treatment	43,883,211 (59.6)	47,093,049 (63.2)[b]	+3,209,838	+6.0	
Without access to treatment	29,693,647 (40.3)	27,440,307 (36.8)[b]	–2,253,340	–8.6	
Centers Accepting Youth Under 13					
	2019 (n, (%))	**2023 (n, (%))**	**Raw Change (n)**	**Proportional Change (%)**	**X^2 (φ)**
US ZIP Codes					0.9 (.004)
With access to treatment	12,205 (31.2)	12,331 (31.5)[a]	+126	+0.9	
Without access to treatment	26,864 (68.8)	26,738 (68.5)[a]	–126	–0.4	
Estimated number of youth					10,574.33 (.008)***
With access to treatment	45,875,792 (62.4)	46,819,526 (62.8)[b]	+943,734	+0.6	
Without access to treatment	27,761,065 (37.6)	27,358,174 (37.2)[b]	–12,765	–1.1	
Centers Accepting Youth Requiring NG Tubes					

	2019 (n, (%))	2023 (n, (%))	Raw Change (n)	Proportional Change (%)	X^2 (φ)
US ZIP Codes					252.2 (.04)***
With access to treatment	8,168 (20.9)	10,045 (25.7)[a]	+1,877	+22.9	
Without access to treatment	30,901 (79.2)	29,024 (74.3)[a]	−1,877	−6.2	
Estimated number of youth					1,215,472.8 (.09)***
With access to treatment	34,229,783 (46.5)	41,425,309 (55.5)[b]	+7,195,526	+19.3	
Without access to treatment	39,347,075 (53.5)	33,108,047 (44.4)[b]	−6,239,028	−17.0	
Centers Self-Describing as "LGBTQ+ Friendly" or Similar That Treat Youth					
	2019 (n, (%))	**2023 (n, (%))**	**Raw Change (n)**	**Proportional Change (%)**	**X^2 (φ)**
US ZIP Codes					8.0 (.02)***
With access to treatment	13,026 (33.3)	13,816 (35.4)[a]	+790	+6.3	
Without access to treatment	26,043 (66.7)	25,253 (64.6)[a]	−790	−3.1	
Estimated number of youth					99668.1 (.03)***
With access to treatment	48,615,305 (66.1)	51,061,401 (68.5)[b]	+2,446,096	+3.6	
Without access to treatment	24,961,552 (33.9)	23,471,957 (31.5)[b]	−1,489,595	−7.1	

[a]Based on 2020 ZIP code boundaries; 2023 ZIP code boundaries not yet available
[b]2023 youth population estimated by applying youth population growth rate of +1.3% from 2019 to 2023 as reported by the US Forum on Child and Family Statistics (childstats.gov)
*$p < .05$
**$p < .01$
***$p < .001$

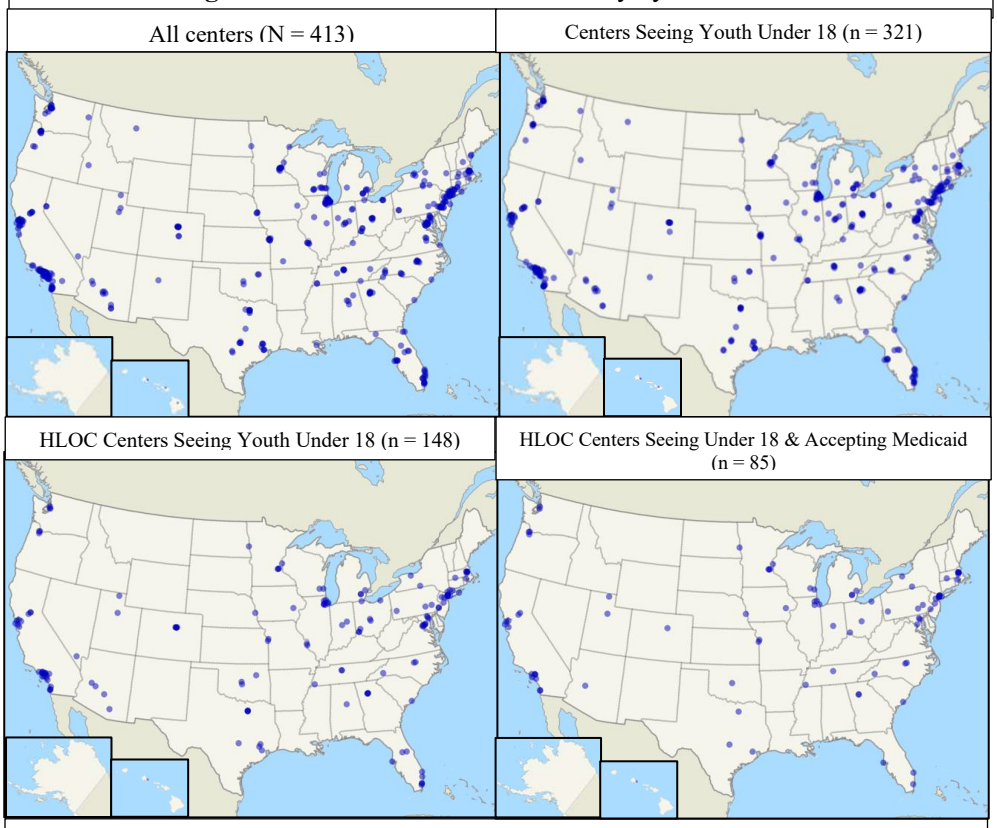
Figure 2a depicts 2023 treatment center availability holistically and at intersections of circumstance (i.e., youth under 18, youth requiring a HLOC, youth with Medicaid insurance requiring a HLOC). As illustrated, a child under 18 with Medicaid requiring a HLOC would have 85 treatment options concentrated in 26 states. Of these centers, most (n=52, 61.2%) were academic medical centers, and of those, most (n=47, 90.4%) were inpatient medical stabilization units. If this same child were under 13, LGBTQ+, and required an NG tube, only 17 HLOCs would be available nationwide, concentrated in 13 states; 11 (64.7%) of these are academic medical centers and 9 (81.8%) are inpatient medical stabilization units.

Treatment Access and Childhood Opportunity

Figure 2b depicts the overlap of treatment sites and COI. As described in Figure 3, the odds of having treatment access within 50 miles were 16% higher for youth in "high" COI areas

(OR=1.16, 95% CI [1.08-1.22], p<.001) and 110% higher for those in "very high" COI areas (OR=2.10, 95% CI [1.96-2.24], p<. 001) compared to those in "moderate" COI areas.

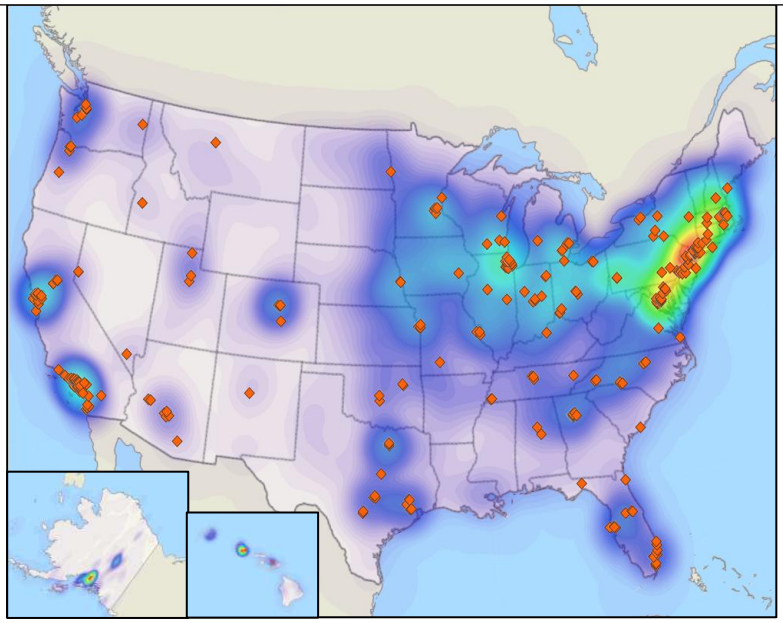
Figure 2a. Treatment center availability by characteristic



● Indicates treatment center in this ZIP code

Note: Markers are semi-opaque to account for density in some areas. Darker circles indicate multiple treatment centers in the area.

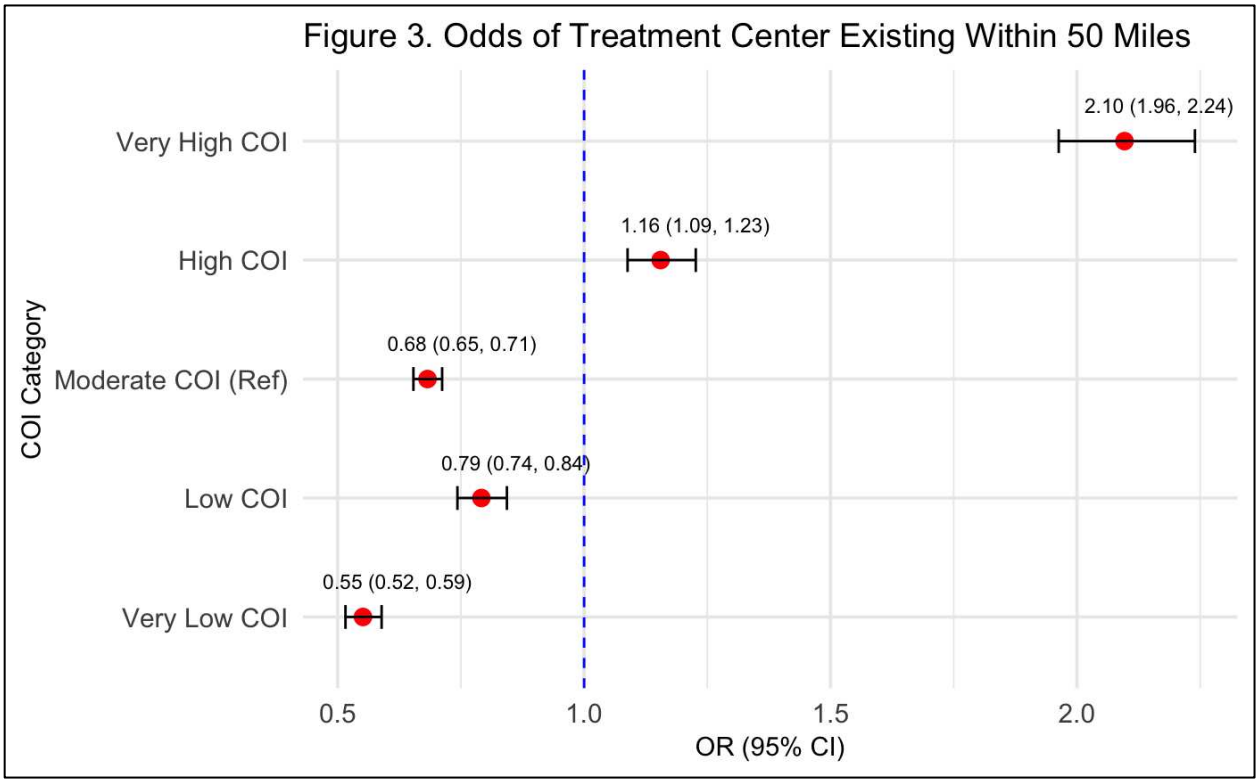
Figure 2b. Visual Representation of Childhood Opportunity Index and ED



◆ Adolescent-Treating ED Treatment Centers in 2023

Low COI — High

Conversely, the odds of having treatment access were 21% lower for individuals in "low" COI areas (OR=0.79, 95% CI [0.74-0.84], p<.001) and 45% lower for those in "very low" COI areas (OR=0.55, 95% CI [0.52-0.58], p<.001).



• Indicates the odds ratio (OR) for each COI category, and confidence intervals are represented by bracketed ranges.

DISCUSSION

This study is among the first to document geographic and circumstantial ED treatment deserts throughout the US before and after the COVID-19 pandemic among youth and/or adults. We noted an increase in the overall number of HLOC centers between 2019 and 2023, largely driven by an increase in residential treatment centers. More in-person centers accepted Medicaid and NG feeds, shrinking important CTDs for youth. Academic medical centers shouldered most

options for medical stabilization. Sixteen states did not offer in-person ED treatment center for youth under 13, and these GTDs did not improve between 2019 and 2023.

The number of youth able to access care improved between timepoints. However, in 2023, nearly 30% of youth still lacked access to in-person ED treatment centers; over 35% lacked HLOC access, and nearly 45% of those requiring NG feeds could not access care. When examining overlapping clinical needs, such as HLOC centers accepting youth under age 13 and accepting public insurance, vast treatment deserts emerged, highlighting important inequities requiring further study. Finally, there were striking overlaps in COI and treatment center access, with youth living in areas with low COI having less access to ED treatment.

While the number of ED treatment centers increased by 10.1% from 2019 to 2023, adolescent ED-related hospital admissions increased 48.6% from 2020 to 2021,[22] suggesting a moderate increase in treatment sites is likely insufficient to meet demand. We noted similar positive trends in youth GTD prevalence. Though most youth (71.2% in 2023) lived in ZIP codes with access to a youth-serving ED treatment center in 2023, nearly 30% of US youth still lacked access to in-person specialty ED treatment.

It is unclear whether newly opened centers are located within areas of highest need. Some data indicate that youth in rural communities may be at elevated risk for EDs.[23] The Midwest region accounted for the greatest increase in treatment centers (23 of 38 total new centers) but we noted decreases in treatment centers in the Southeast and Southwest regions. Finally, numerous states had no pediatric ED treatment centers, revealing stark vacuums in access to care for their youth with EDs.

The number of youths with Medicaid having access to ED treatment increased by 6% between timepoints. This finding is encouraging as lack of insurance coverage is the most

frequent barrier to treatment access.[24,25] However, the increase is unlikely to meet demand, and Medicaid coverage varies widely between states. While many centers accepting public insurance were hospitals providing medical stabilization, fewer longer-term therapeutic centers accepted Medicaid, and youth with Medicaid were most likely to be limited to inpatient medical stabilization units. Though short-term medical stabilization is often a critical component of treatment, it does not offer substantial mental health support, and evidence suggests that parents and families find mental health support lacking on medical stabilization units.[6]

We noted small improvements across all circumstantial variables between 2019 and 2023: overall access, HLOC access, accepting youth under 18 and 13, allowing NG tubes, interpreter services, gender inclusivity, and self-describing as "LGTBQ+ friendly". These improvements, though slight and with small effect sizes, indicate that certain circumstantial barriers to accessing care for youth with EDs may be decreasing. Racial and ethnic minorities (who may be more likely to need an interpreter) are less likely to be diagnosed and treated for an ED.[26] Furthermore, EDs are more prevalent in sexual and gender minorities,[27] and these individuals report their identity as a barrier to effective care.[25] Our findings corroborate literature suggesting that access for youth from low income households,[6,12] rural youth,[23] and those whose presentations do not align with stereotypical notions of one who suffers from an ED, (thin, White, affluent girls), are disadvantaged when accessing care.[25,27]

The increase of virtual care programs is encouraging, with 17 virtual care options and some coverage in all states by 2023. However, areas most lacking healthcare are also most likely to lack internet access,[28,29] limiting the utility of telemedicine platforms.[30] Virtual programs must have licensed providers in each state in which they provide care, as well as state-specific contracts, and therefore cannot easily cover care nationally. In addition, youth with severe illness

still require in-person care, either due to medical or psychiatric safety considerations or because their ED behaviors require in-person monitoring. To date, there are no studies directly comparing severely ill youth with EDs and either medical or psychiatric safety concerns using in-person vs virtual care.

There was strong overlap between COI and ED treatment center access by ZIP code. This relationship is consistent with research suggesting that youth in low-COI areas are significantly less likely to connect with mental healthcare.[31] Our findings are concerning as youth in low- or very low-COI areas are more likely to receive a mental health diagnosis than their peers in higher-COI areas, potentially necessitating specialized treatment.[21,32] Furthermore, evidence suggests that those who experience intersecting unmet health-related social needs including food insecurity are more likely to engage in disordered weight control behaviors[33] closely related to ED development.[34]

Limitations

Though we believe our findings have significant implications for ED care and broader public health, our study is not without limitations. First, the use of census tract-level data is preferable to ZIP code-level data in geospatial analysis. We used ZIP code-level data to easily access 50-mile radii and better define treatment deserts. Second, our analysis of center characteristics relied on self-reported data on search engines and center websites, and as such, only treatment centers with an online presence were included. Further, we cannot verify that self-reported data are updated or reflective of patients' experience, nor that the care offered at each level of care is consistent. It is also unclear whether more frequent endorsement of certain center characteristics was related to true practice changes or a response to market demands to list such attributes on their website. Because data were limited to online availability, we also could not

perform detailed analyses to identify possible confounders of relationships elicited; this would be important to consider in future prospective studies. Finally, this study focused on intensive outpatient, partial hospitalization, residential, inpatient psychiatric units, and inpatient medical stabilization units, rather than fully outpatient sites or those that do not primarily treat EDs, but accept some ED patients with co-morbid diagnoses.

CONCLUSION

Our study found that geography and circumstance play a significant role in accessing ED care. Despite the high and growing prevalence of EDs across the US, access to ED care remains inequitable, with rural, low COI, and identified treatment desert areas requiring greater focus to improve outcomes, and youth with multiple intersecting barriers, such as insurance status, medical complexity, and identity, having greater disparities in access. Both independent treatment centers and academic medical centers play important roles in the treatment landscape. Although the COVID-19 pandemic coincided with a small increase in in-person ED care availability, this growth in treatment centers did not keep pace with rising demand, nor was it uniformly distributed across geographic areas or patient circumstances. Future research should further characterize gaps in access by exploring how treatment availability aligns with demand. Additionally, innovative strategies are needed to make in-person care more accessible for those in underserved areas, alongside efforts to expand and optimize virtual treatment options to bridge these gaps.

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