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ORIGINAL RESEARCH ARTICLE

Shifts in US Pediatric Obesity Treatment After the AAP Guidelines

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ABSTRACT

BACKGROUND/OBJECTIVES: This study evaluated changes in child and adolescent obesity treatment initiation following 2023 American Academy of Pediatrics (AAP) guidelines recommending early intervention for obesity.

METHODS: Using electronic health record data from a collective of US health systems, we identified outpatient visits for children (aged 8–11 years) and adolescents (aged 12–17 years) with obesity (body mass index [BMI] at visit ≥95% percentile) and without type 2 diabetes between 2021 and 2024. A visit was randomly sampled for patients with multiple eligible visits. Patients without recent specific obesity treatment were followed for evidence of initiation, including nutrition referral (within 14 days) or counseling (within 90 days) and, separately, prescriptions for weight management pharmacotherapies (on- or off-label; within 14 days). Adjusted interrupted time series models estimated differences in the likelihood of incident nutrition counseling or referral and, separately, pharmacotherapy before vs after the guidelines.

RESULTS: Among 310 503 study patients (36.9% children, 63.1% adolescents), the mean (SD) BMI percentile was 97.4 (1.6) and 35.7% had severe obesity (class 2 or 3). Few patients without a recent history of specific obesity treatment had evidence of initiation during or shortly after their visit: 9.7% for nutrition referral or counseling and 0.4% for pharmacotherapy. Following the guidelines, the likelihood of pharmacotherapy initiation increased immediately (odds ratio [OR], 1.65; 95% CI, 1.23–2.21) and monthly since release (OR, 1.05; 95% CI, 1.03–1.07). No immediate change was observed in nutrition counseling/referral (OR, 1.05; 95% CI, 0.98–1.12), but a small increase in monthly trend since release occurred (OR, 1.01; 95% CI, 1.00–1.01).

CONCLUSIONS: Pharmacotherapy initiation increased after the AAP guidelines but remained low, whereas nutrition therapy was more common but changed minimally.

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Dr Rodriguez conceptualized and designed the study, conducted analyses, drafted the initial manuscript, and reviewed and revised the manuscript. Drs Wright and Stucky conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised the manuscript. Drs Do, Gratzl, and Ms Goodwin-Cartwright contributed to analysis development and review and critically reviewed the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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WHAT'S KNOWN ON THIS SUBJECT: In 2023, the American Academy of Pediatrics (AAP) first recommended early obesity treatment, including intensive lifestyle intervention and pharmacotherapy. However, the impact of these guidelines on the uptake of obesity treatment remains unknown.

WHAT THIS STUDY ADDS: This study evaluated changes in incident use of obesity treatment for US children and adolescents following AAP guidelines. Although lifestyle intervention remained far more common across the study period, pharmacotherapy use increased to a larger degree following the new AAP guidelines.

Background

Obesity occurs in approximately 20% of youth in the United States,[1] and it is associated with increased short- and long-term health risks, including cardiovascular disease, type 2 diabetes (T2D), hypertension, hyperlipidemia, and mental health conditions.[2–5] In January 2023, the American Academy of Pediatrics (AAP) issued its first recommendations for the evaluation and treatment of obesity among children and adolescents, emphasizing the importance of early, evidence-based treatment.[6]

The AAP guidelines identify intensive health behavior and lifestyle treatment (IHBLT) as the first-line intervention. This approach involves frequent, family-based counseling with highly trained providers over several months, ideally involving at least 26 in-person contact hours.[6] However, lifestyle intervention alone has been associated with modest weight reductions for youth, and access to intensive programs is often limited, particularly outside of urban areas.[7,8] For adolescents aged 12 years and older, AAP guidelines also recommend offering pharmacotherapy adjunctive to IHBLT.[6] The guidelines do not recommend pharmacotherapy for children aged 8–11 years given insufficient evidence, although it may be considered on a case-by-case basis.

In spite of alignment with the evidence-based literature and input from a diverse group of advisors, the AAP guidelines' support of early pharmacotherapy was met with some criticism from clinical and public health communities.[9–11] Concomitant with the rising popularity of new, highly effective glucagon-like peptide 1 receptor agonists (GLP-1 RAs),[12] concerns were raised about inappropriate overuse of pharmacotherapy in children, weight stigmatization, and the risk of eating disorders.[13] Moreover, GLP-1 RA use in adolescents is likely not cost-effective at current prices.[14] Although previous studies have identified minimal use of obesity pharmacotherapy among children and adolescents overall,[15–17] little is known about use before vs after the AAP guideline release.

Given these concerns, this real-world retrospective cohort study aims to evaluate shifts in the initiation of obesity treatment for children and adolescents, including nutrition counseling and pharmacotherapy, after the release of the AAP guideline.

Methods

Study Design

This study used electronic health records (EHRs) from a group of US health systems to identify visits for children and adolescents aged 8–17 years who were potentially eligible for obesity treatment. Eligible visits were defined as outpatient office visits where the patient had a body mass index (BMI) meeting obesity criterion (defined below) and no evidence of recent specific obesity treatment. To improve observability of recent treatment, the sample was restricted to patients with at least 1 outpatient office visit in the 15 months before the encounter. Patients were followed to assess incident obesity treatment during or shortly after the visit, including referral to a nutritionist or dietician, evidence of nutritional/dietary counseling, and pharmacotherapy used on- or off-label for weight management. Interrupted time series (ITS) models compared the likelihood of receiving obesity treatments before vs after the AAP guidelines were released.

This retrospective observational cohort study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.[18]

Data

This study used a subset of Truveta Data, a continuously updated and linked EHR data source from a collective of 30 US health care systems with more than 100 million patients.[19] Truveta Data reflects real-world clinical care delivered at health systems across the United States, which is not limited to large academic medical centers or children's hospitals. Data include structured information on demographics (age, sex, and health system-reported race and ethnicity), encounters, diagnoses, vital signs (eg, weight, height, and BMI), prescriptions, laboratory tests and results (eg, hemoglobin A1c), and procedures. In addition to EHR data for care delivered within Truveta constituent health care systems, data related to medication dispensing are available through linked third-party data. Medication dispensing (via e-prescribing) includes fills for prescriptions written both within and outside Truveta constituent health care systems, resulting in greater observability into patients' medication history.

Data were normalized into a common data model through syntactic and semantic normalization. Truveta Data were then de-identified by expert determination under the US Health Insurance Portability and Accountability Act Privacy Rule. This study used only de-identified patient records and therefore did not require institutional review board approval. Data for this study were accessed on May 23, 2025, using Truveta Studio. The authors were solely responsible for the design, conduct, analysis, and interpretation of the study. No Truveta employees outside the listed authors had a role in the study design, data analysis, manuscript preparation, or review. Truveta contributed study data and computing. Analyses were conducted in R (version 4.4.1) within a cloud-based notebook environment leveraging Apache Spark, using both R and SparkR.

Study Population and Exposure

Visits for children (ages 8–11 years) and adolescents (ages 12–17 years) potentially eligible for obesity treatment were identified as outpatient and office visits between January 2021 and December 2024, with a BMI percentile meeting the obesity criterion, no previous or concurrent T2D diagnosis, and at least 1 outpatient office encounter in the previous 15 months. The study relied on BMI observation values in the EHR instead of diagnostic codes for obesity. Obesity was defined as BMI greater

than the 95th percentile for age (in months) and sex, per US Centers for Disease Control and Prevention (CDC) definitions.[20] Class II obesity (BMIs of 120% to <140% of the 95th percentile or 35 to <40 kg/m^2) and class III obesity (40% or more of the 95th percentile or ≥40 kg/m^2) were similarly defined using CDC criteria.[21] Given computational constraints of longitudinal models with correlated data for large numbers of patients and observations, a single visit was randomly selected as the index visit for patients with multiple qualifying visits.

The AAP guidelines were released on January 7, 2023. For patient privacy reasons, exact visit dates in these data were obscured to the first day of the month. Visits occurring before January 1, 2023, were considered preguideline, and visits occurring after January 1, 2023, were considered postguideline. For all postguideline visits, the number of months elapsed since guideline release were also defined.

Patient comorbidities, treatment history, and prior medication prescribing and dispensing were characterized at the time of the index visit. Comorbidities, including Attention-Deficit/Hyperactivity Disorder (ADHD), asthma, hyperlipidemia, hypertension, and obstructive sleep apnea were identified using Systematized Nomenclature of Medicine - Clinical Terms (SNOMED-CT) and *International Classification of Diseases* (*ICD*) codes, considering all available history up to and including the index visit. Recent treatment (nutrition counseling or referral and pharmacotherapy) was assessed in the year before the patient's index visit. Previous evidence of pharmacotherapy relied on dispensing information, including medications prescribed outside of Truveta constituent health systems.

Outcomes of Obesity Treatment

This study separately considered 2 obesity treatments: (1) nutrition counseling or referral and (2) pharmacotherapy. Because this study aimed to evaluate changes in incident obesity treatment related to guidelines, patients with a recent history of the specific treatment (in the previous year) were excluded from treatment-specific analyses. A 1-year period was selected given the expectation of approximately annual child health visits, a recommendation for at least 26 weeks of IHBLT, and the need to wait for intervention effects to be observed given rapid changes in height and weight with puberty.

Nutrition Counseling

Nutrition counseling and referrals for nutrition counseling served as a proxy for IHBLT, the primary, first-line treatment recommended by AAP guidelines.[6] Given delays between visits and referrals to or delivery of counseling, nutrition referral outcomes were considered within 14 days of the eligible visit and counseling was considered within 90 days. Nutrition counseling was identified using SNOMED-CT, *ICD-10*, and Healthcare Common Procedure Coding System codes for nutrition/diet counseling, nutrition care education, nutrition assessment, and nutrition and dietary surveillance. SNOMED-CT codes were used to identify referrals to dietitians and nutrition professionals (Supplemental Tables 1 and 2).

Pharmacotherapy

Pharmacotherapy outcomes were identified as prescriptions written for pharmacotherapies listed in the AAP guidelines within 14 days of the visit. Although most prescribing is expected to occur on the day of the visit, a 14-day period was used to account for possible delays. Medications included on- or off-label use of metformin, GLP-1–based medications, orlistat, phentermine alone, topiramate alone, and combination phentermine-topiramate.[6,22,23] Lisdexamfetamine, which was included in the AAP guidelines because of an indication for binge-eating disorder, was not included because it is predominantly used for ADHD and may have been affected by supply disruptions during the study period.[24] Furthermore, this analysis included all GLP-1–based drugs, without restriction to approved use or population. Only liraglutide (as Saxenda) and semaglutide (as Wegovy) are approved for adolescent weight management. Dulaglutide and exenatide are approved for adolescents with T2D but may be used off-label in patients without T2D.[16] Other GLP-1–based medications, including the dual agonist tirzepatide, are approved for use in adults only but may be used off-label in younger populations.[16] For brevity, we use the term GLP-1 to refer to both GLP-1 RAs and dual agonists.

A sensitivity analysis was performed focusing exclusively on pharmacotherapy in adolescents, given the AAP pharmacotherapy recommendation was specific to patients aged 12 years and older.

Statistical Analysis

Using logistic regression, separate ITS models assessed the impact of the AAP guideline release on the receipt of incident treatment with (1) nutrition referral or counseling and (2) pharmacotherapy. All models controlled for patient demographics (age, child [vs adolescent], sex, and race), BMI percentile at the visit, and clinician specialty. A calendar month fixed effect was included to account for seasonality.[25,26] A state fixed effect was used to account for clustering within health systems.

Two primary effects were considered: (1) a level change in the intercept after the AAP guideline release, representing an immediate change in the likelihood of incident treatment, and (2) a slope change after the AAP guideline release, representing a more gradual monthly change in incident treatment use. Among patients with any prescription, the proportion prescribed each drug in the pre- vs postguideline periods were compared using 2-sample tests of proportions.

A sensitivity analysis using bootstrapping was performed to assess robustness across random samples, including the random sampling of a single visit per patient. In each of

500 bootstrapped samples, n patients were selected with replacement and a random visit was selected for each resampled patient. Regressions were estimated on each bootstrap sample and empirical CIs (the 2.5th and 97.5th percentile of the distribution of estimates) were obtained.

Results

Patient Characteristics

In total, 5 287 074 outpatient office visits with BMI information from 1 738 931 patients aged 8–17 years without T2D occurred during the study period. Of these, 1 234 798 visits (23.4%) from 436 315 (25.1%) patients met the obesity criterion, and 979 510 (79.3%) visits from 310 503 (71.2%) patients also had a visit in the preceding 15 months. A single visit was sampled randomly per patient, yielding a final study population of 310 503 visits from the same number of patients.

The study population included 114 506 (36.9%) children (aged 8–11 years) and 195 997 (63.1%) adolescents (aged 12–17 years). The mean (SD) age was 13.2 (3.0) years, and 142 669 (45.9%) patients were female. Based on health system–documented race, 13 581 (4.4%) patients were Asian, 45 304 (14.6%) were Black or African American, 4904 (1.6%) were Native Hawaiian or Pacific Islander, 172 089 (55.4%) were white, 36 050 (11.6%) were other races, and 38 575 (12.4%) had unknown race. The mean (SD) BMI percentile was 97.4 (1.6), with 71 937 (23.2%) having class II and 38 963 (12.5%) having class III obesity.

Of visits where clinician background information was available (83 943 [27.0%]), most visits (80 781 [96.2%]) occurred with primary care clinicians, including pediatricians (44 158 [52.6%]), family or internal medicine practitioners (17 963 [21.4%]), physician assistants or nurse practitioners (11 241 [13.4%]), and residents (7411 [8.8%]).

The preguideline period included 151 005 patients, and the postguideline period included 159 498 patients. Demographic and health characteristics at patient visits were largely similar between these 2 periods, although patients in the postguideline period were slightly younger on average (Table 1). Patient characteristics after recent treatment exclusion are provided in the Supplemental Material for both outcomes (Supplemental Tables 3 and 4).

Nutrition Referral or Counseling

Of 310 503 patients, 28 696 (9.2%) had evidence of recent nutrition referral or counseling in the year before their visit and were excluded from incident nutrition treatment analyses. Of the remaining 281 807 patients, 27 339 (9.7%) had evidence of incident nutrition referral within 14 days of the visit or nutrition counseling within 90 days after the visit. The likelihood of incident nutrition counseling or referral was higher in patients with Asian and Black race, compared with white race, and higher for visits with a pediatrician, compared with other clinicians (Figure 1).

Incident nutrition counseling and referral increased across the full period studied ($P < .01$). No significant immediate change was observed in the likelihood of incident nutrition counseling or referral (intercept) immediately after the AAP guideline release (odds ratio [OR], 1.05; 95% CI, 0.98–1.12). However, monthly changes in treatment rate (change in slope) were slightly greater during the postguideline period compared with the preguideline period (OR, 1.01; 95% CI, 1.00–1.01; $P < .01$) (Figure 2).

Pharmacotherapy

Of the 310 503 patients in this study, 4953 (1.6%) had evidence of pharmacotherapy prescribing or dispensing in the year before the visit and were excluded from incident pharmacotherapy treatment analyses. Of the remaining 305 550 patients, 1180 (0.4%) had evidence of incident pharmacotherapy prescribing within 14 days after the index visit. Incident prescribing was more common for female patients, those with higher BMI, and adolescents (compared with children) (Figure 1).

Significant increases were observed in both the incident prescribing level (intercept) (OR, 1.65; 95% CI, 1.23–2.21) and monthly prescribing trend (slope) (OR, 1.05; 95% CI, 1.03–1.07) following the AAP guideline release (Figure 3). Results of the sensitivity analysis including adolescents only were similar to those of the primary analysis (Supplemental Figure 1). Treatment likelihood increased significantly with BMI percentile.

Metformin was the most prescribed medication overall, but its use declined over time (Figure 4). During the preguideline period, 80.2% of patients newly prescribed any pharmacotherapy were prescribed metformin, compared with 63.0% in the postguideline period ($P < .01$). In contrast, semaglutide use increased substantially, from 2.5% of patients with any prescription in the preguideline period to 26.8% in the postguideline period ($P < .01$). Additional representations are provided in Supplemental Figure 2.

Bootstrapped estimates were similar to the primary estimates (Supplemental Table 5).

Discussion

In this large, real-world study of children and adolescents with obesity and without recent documented treatment, a minority of patients had evidence of incident obesity treatment. Nutrition counseling was more common than obesity pharmacotherapy across the entire study period. However, significant increases in incident treatment following the AAP guideline release were observed for pharmacotherapy, with evidence of both an immediate increase in prescribing and greater changes in monthly prescribing.

These study findings suggest a gradual adoption of AAP pharmacotherapy guidelines over time. However, the timing of the AAP guideline release coincided with surging national

TABLE 1. Patient Characteristics

Characteristic	Preguideline (n = 151 005)	Postguideline (n = 159 498)	Overall (N = 310 503)
Age group, n (%)			
Adolescent (12–17 years)	101 433 (67.2)	94 564 (59.3)	195 997 (63.1)
Child (8–11 years)	49 572 (32.8)	64 934 (40.7)	114 506 (36.9)
Age, mean (SD), years	13.5 (2.9)	13.0 (3.0)	13.2 (3.0)
Female sex, n (%)	68 850 (45.6)	73 819 (46.3)	142 669 (45.9)
Race, n (%)			
Asian	6548 (4.3)	7033 (4.4)	13 581 (4.4)
Black	23 148 (15.3)	22 156 (13.9)	45 304 (14.6)
Native Hawaiian or other Pacific Islander	2537 (1.7)	2367 (1.5)	4904 (1.6)
White	83 984 (55.6)	88 105 (55.2)	172 089 (55.4)
Other	17 845 (11.8)	18 205 (11.4)	36 050 (11.6)
Unknown	16 943 (11.2)	21 632 (13.6)	38 575 (12.4)
Ethnicity			
Hispanic or Latino	37 657 (24.9)	39 244 (24.6)	76 901 (24.8)
Not Hispanic or Latino	98 937 (65.5)	103 464 (64.9)	202 401 (65.2)
Unknown	14 411 (9.5)	16 790 (10.5)	31 201 (10.0)
State, n (%)			
Texas	30 106 (19.9)	31 769 (19.9)	61 875 (19.9)
Illinois	16 066 (10.6)	16 847 (10.6)	32 913 (10.6)
Washington	13 905 (9.2)	14 492 (9.1)	28 397 (9.1)
New York	15 423 (10.2)	17 396 (10.9)	32 819 (10.6)
Wisconsin	12 674 (8.4)	12 992 (8.1)	25 666 (8.3)
Michigan	10 044 (6.7)	11 077 (6.9)	21 121 (6.8)
Ohio	9274 (6.1)	7994 (5.0)	17 268 (5.6)
California	10 324 (6.8)	9267 (5.8)	19 591 (6.3)
Virginia	5984 (4.0)	6058 (3.8)	12 042 (3.9)
Other	16 547 (11.0)	21 329 (13.4)	37 876 (12.2)
Unknown	10 658 (7.1)	10 277 (6.4%)	20 935 (6.7)
BMI percentile, mean (SD)	97.4 (1.6)	97.4 (1.6)	97.4 (1.6)
BMI value, mean (SD)	30.7 (5.9)	30.0 (5.9)	30.3 (5.9)
Obesity class, n (%)			
Class 1 obesity	96 453 (63.9)	103 150 (64.7)	199 603 (64.3)
Class 2 obesity	35 100 (23.2)	36 837 (23.1)	71 937 (23.2)
Class 3 obesity	19 452 (12.9)	19 511 (12.2)	38 963 (12.5)
Severe obesity, n (%)	54 552 (36.1)	56 348 (35.3)	110 900 (35.7)
Clinician background, n (%)			
Pediatrics	21 582 (14.3)	22 576 (14.2)	44 158 (14.2)
Family or internal medicine	9139 (6.1)	8824 (5.5)	17 963 (5.8)
PA/NP	4975 (3.3)	6266 (3.9)	11 241 (3.6)
Residency	3175 (2.1)	4236 (2.7)	7411 (2.4)

(Continued on next page)

TABLE 1. Patient Characteristics (Continued)

Characteristic	Preguideline (n = 151 005)	Postguideline (n = 159 498)	Overall (N = 310 503)
Other	1475 (1.0)	1616 (1.0)	3091 (1.0)
Unknown	110 659 (73.3)	115 980 (72.7)	226 639 (73.0)
History of nutrition counseling or referral, n (%)			
Previous 30 days	1385 (0.9)	1708 (1.1)	3093 (1.0)
Previous 90 days	3838 (2.5)	4712 (3.0)	8550 (2.8)
Previous year	12 879 (8.5)	15 817 (9.9)	28 696 (9.2)
History of antiobesity medications, n (%)			
Previous 30 days	706 (0.5)	965 (0.6)	1671 (0.5)
Previous 90 days	1257 (0.8)	1705 (1.1)	2962 (1.0)
Previous year	2095 (1.4)	2858 (1.8)	4953 (1.6)
Comorbidities, n (%)			
ADHD	20 163 (13.4)	23 339 (14.6)	43 502 (14.0)
Asthma	34 209 (22.7)	35 985 (22.6)	70 194 (22.6)
Hypertension	4118 (2.7)	3948 (2.5)	8066 (2.6)
Hyperlipidemia	9401 (6.2)	9480 (5.9)	18 881 (6.1)
Obstructive sleep apnea	7938 (5.3)	10 847 (6.8)	18 785 (6.0)
Outpatient office visits, previous 12 months, mean (SD)	2.6 (3.6)	2.6 (3.5)	2.6 (3.5)
Calendar month, n (%)			
January	10 557 (7.0)	11 689 (7.3)	22 246 (7.2)
February	9912 (6.6)	11 914 (7.5)	21 826 (7.0)
March	12 994 (8.6)	12 185 (7.6)	25 179 (8.1)
April	12 096 (8.0)	12 167 (7.6)	24 263 (7.8)
May	10 909 (7.2)	12 710 (8.0)	23 619 (7.6)
June	11 851 (7.8)	11 690 (7.3)	23 541 (7.6)
July	12 605 (8.3)	13 261 (8.3)	25 866 (8.3)
August	17 200 (11.4)	17 126 (10.7)	34 326 (11.1)
September	14 430 (9.6)	15 173 (9.5)	29 603 (9.5)
October	14 107 (9.3)	15 878 (10.0)	29 985 (9.7)
November	13 528 (9.0)	13 616 (8.5)	27 144 (8.7)
December	10 816 (7.2)	12 089 (7.6)	22 905 (7.4)

Abbreviations: ADHD, Attention-Deficit/Hyperactivity Disorder; BMI, body mass index; NP, nurse practitioner; PA, physician assistant.
"Other" race includes multiple races and other single races representing less than 1% of the study population. "Other" state includes all states representing less than 3% of the study population.

interest in GLP-1–based antiobesity medications[27,28] and large increases in their use across the United States.[12,16,29] Changes in the pharmacotherapy treatment of children and adolescents may therefore reflect a greater acceptance of antiobesity medications generally[30,31] rather than a direct impact of the AAP guidelines.

Despite early concerns about potential overuse or premature use of antiobesity medications, we found that absolute rates of pharmacotherapy remained low in this population. Recent studies have found similarly low rates of guideline-concordant screening for obesity-related comorbidities in children and low rates of antiobesity medication use[15,17,32]; however, the estimated rates vary.[15,16,33] A recent study of youth with 3 or more encounters with obesity between 2017 and 2020 found that 8% of patients used antiobesity medications.[15] The higher prevalence of antiobesity medication use in that study is likely attributable to its longer assessment period, higher average BMI values, and most patients taking metformin having a diagnosis of T2D or metabolic syndrome. Evidence of higher pharmacotherapy use by female patients is consistent with patterns in adult

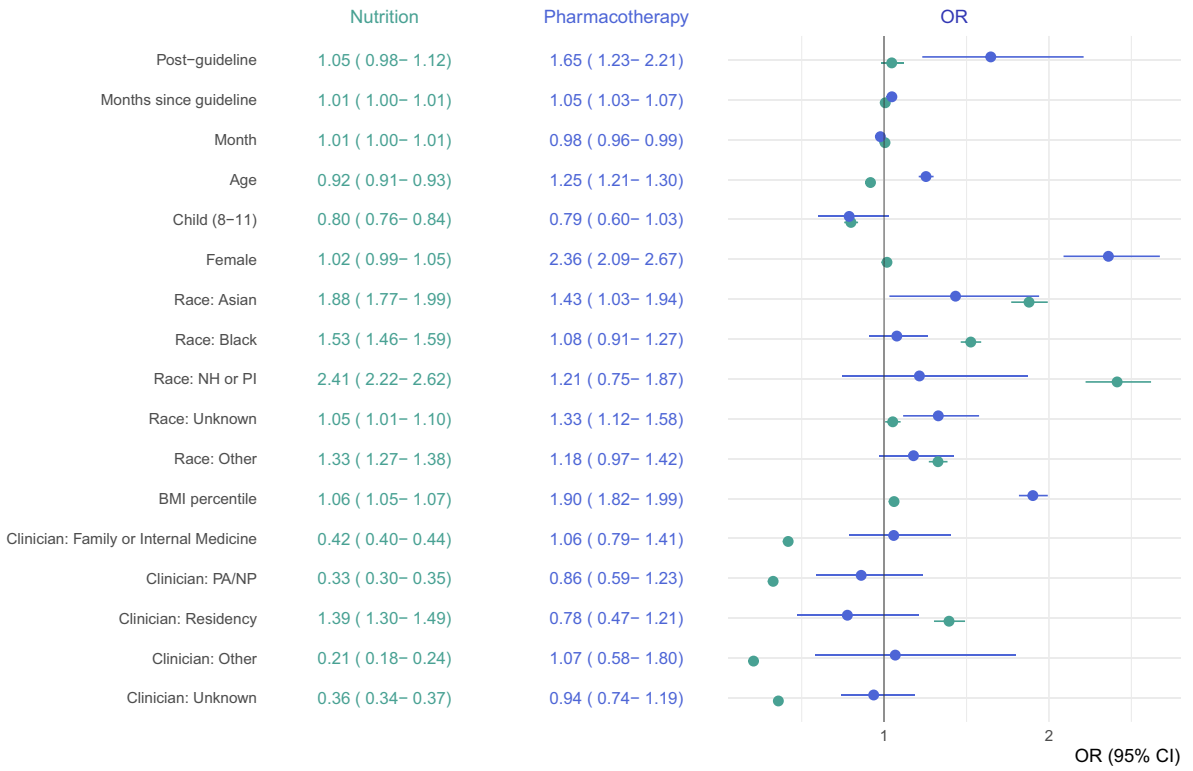

FIGURE 1. Selected adjusted ORs from separate logistic regressions considering the probability of incident treatment before and after guidelines. Points represent adjusted ORs and lines represent 95% CIs. Patients with a recent history (in the prior year) of the specific treatment were excluded. ORs for race are relative to white race, and ORs for clinicians are relative to pediatricians. Time represents the time (in months) since study start and time since guideline represents time (in months) since the American Academy of Pediatrics guideline release for observations in the postguideline period.
Abbreviations: NH, Native Hawaiian; NP, nurse practitioner; OR, odds ratio; PA, physician assistant; PI, Pacific Islander.

populations,[12,34] as well evidence of greater weight stigmatization and weight loss behaviors for female youth.[35,36]

There is extensive existing literature about barriers and facilitators to physicians offering and families engaging in childhood obesity treatment, including IHBLT and pharmacotherapy.[37,38] Barriers include caregivers not accurately assessing a child's weight class, structural barriers to behavior change and treatment engagement, lack of insurance coverage, time, insufficient clinician decision support, limited social support, and stigma. Given many implementation challenges hindering the translation of evidence-based research into practice,[39] additional efforts are needed to disseminate effective obesity treatments.

Reasons for the high prevalence of nutrition counseling relative to pharmacotherapy in this sample may include clinician reluctance to prescribe antiobesity medications,[40–42] caregiver reluctance to use pharmacotherapy,[43] and the limited insurance coverage for antiobesity medications.[44,45] Although research has explored policy- and systems-level opportunities to reduce the prevalence of childhood obesity,[44,46–48] more research is needed to understand clinician-level factors including communication about obesity treatment options.[40,42,49] This is especially relevant in the era of robust social media discourse and direct-to-consumer advertisement of GLP-1 medications (particularly compounded medications).[28,50–52] Moreover, research about the safety profile of newer GLP-1 medications for adolescents is needed to support informed decision-making about obesity pharmacotherapy.[23]

This study has several strengths. First, the data represent a large, diverse, and generalizable population of US children and adolescents treated in routine clinical settings. Notably, this study does not include large children's hospitals, where rates of treatment may be higher given greater access to IHBLT and efforts to adopt guidelines may differ.[45,53] Additionally, this study relied on BMI values measured during visits and captured in the EHR rather than billing codes in claims data, which may be inconsistently captured.

This study is also subject to limitations. Capture of obesity treatment in EHR data is likely incomplete and may vary between health systems. Patients may have received care from providers

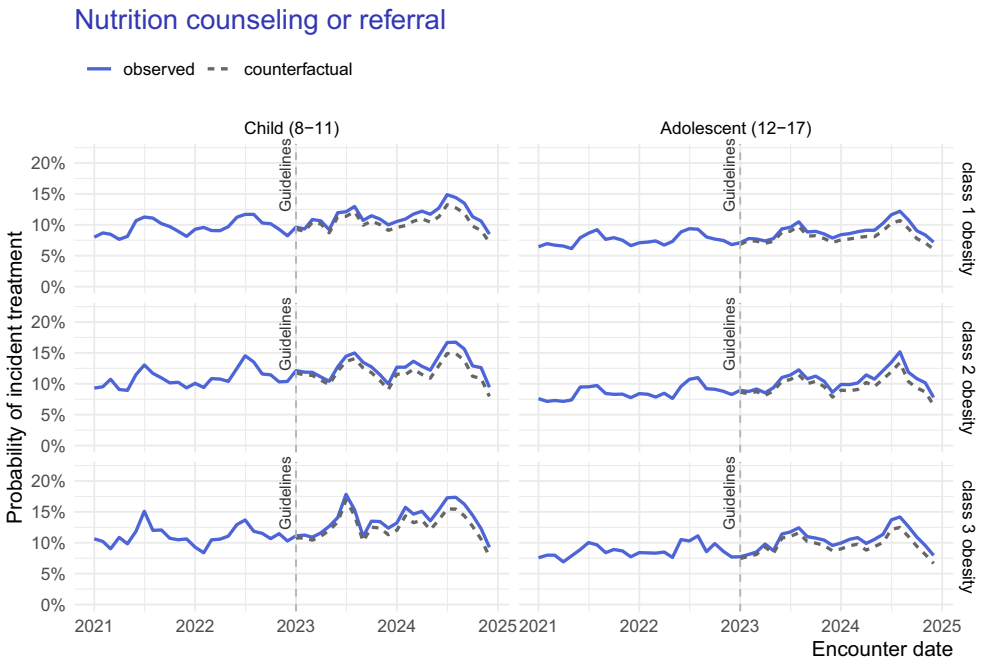

FIGURE 2. Interrupted time series of incident treatment with nutrition counseling or referral over time, by age and body mass index class. Blue lines represent the predicted probabilities of treatment for the observed population, and dashed gray lines represent the counterfactual (absent new guidelines) for the observed population.

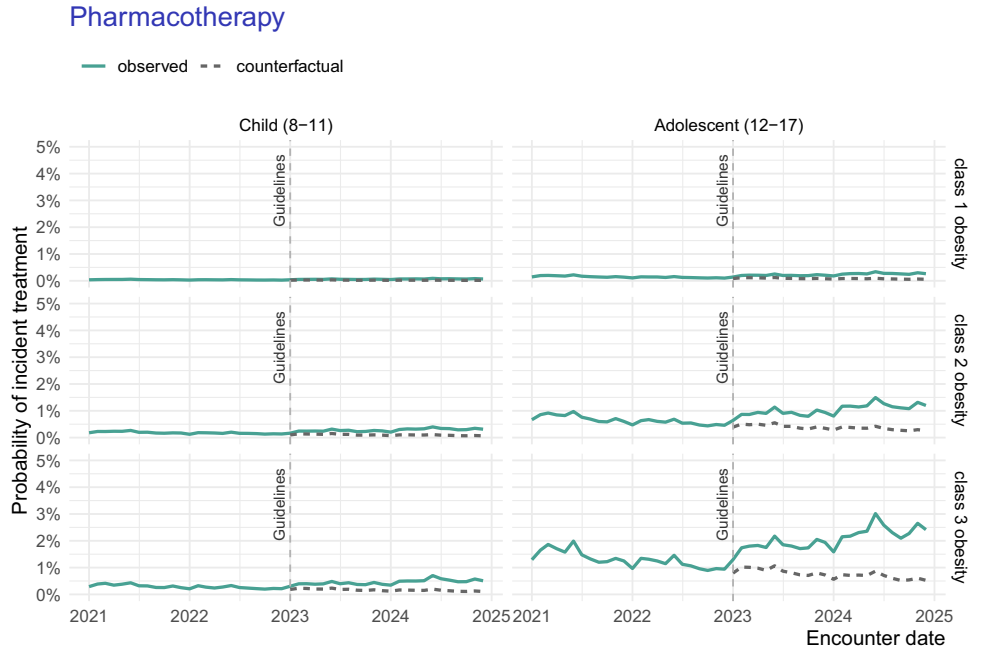

FIGURE 3. Interrupted time series of incident treatment with antiobesity medication over time, by age and body mass index class. Green lines represent the predicted probabilities of treatment for the observed population, and dashed gray lines represent the counterfactual (absent new guidelines) for the observed population.

not represented in this data set, and discussions about nutrition and physical activity may occur outside the formal health system or be recorded variably. Additionally, nutrition referral and counseling are not exclusive to obesity treatment and are merely proxies for IHBLT.[54] We expect that specificity is similar in the pre- and postguideline periods, such that misclassification is

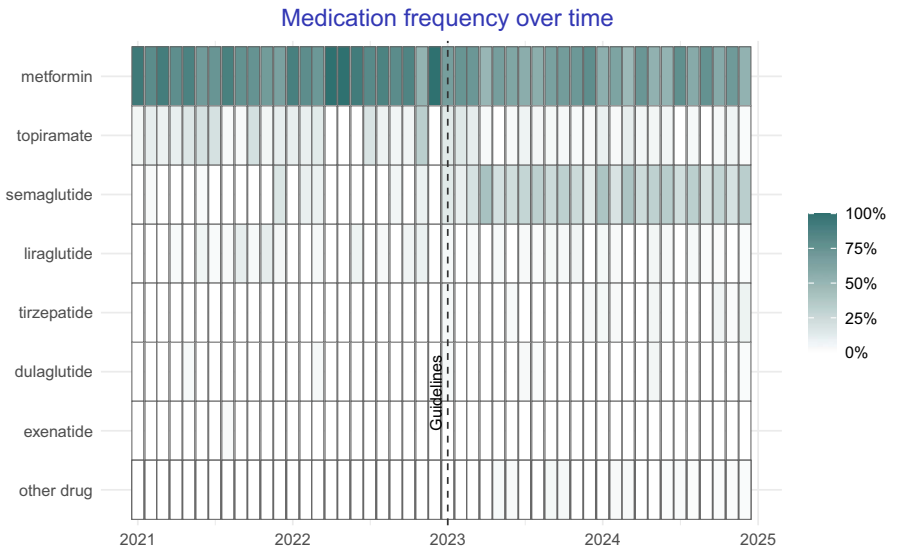

FIGURE 4. Proportion of patients who received a prescription for each antiobesity medication within 14 days of their visit, among those with any antiobesity medication prescription. The x-axis is plotted in months. The dashed vertical line represents the American Academy of Pediatrics guideline release. Medications are not mutually exclusive (patients can be prescribed >1 medication at a visit). "Other drug" includes orlistat, phentermine, and phentermine-topiramate.

likely nondifferential and would bias results toward the null. Furthermore, regardless of physician intention to intervene in early obesity, a variety of barriers to effective treatment exist, including limited access to comprehensive IHBLT, geographic clustering of programs, and high costs of the most effective pharmacotherapies.[45] High rates of unknown race in this study likely result from the de-identification processes that mask certain demographic data to ensure patient privacy, rather than reflecting true unknown race of patients.[19] Similar to other recent papers,[14] we did not consider bariatric surgery, which typically occurs in a small subset of the adolescents at the highest BMI percentiles. Because not all health systems contributed provider data, most encounters had unknown provider specialties. However, results from a sensitivity analysis restricted to encounters with known provider specialties were highly consistent with the primary findings. Finally, because this study considered the impact of guidelines on treatment choices, patients already receiving treatment were excluded. However, prevalent treatment of obesity remains an important topic for future research.

Conclusion

Following new comprehensive obesity guidelines from the AAP, there were concerns about support for obesity pharmacotherapy for adolescent populations. This study found that incident use of pharmacotherapy increased significantly in children and adolescents with obesity and without T2D. Despite large relative increases, absolute levels of pharmacotherapy treatment in this population remained low. Future research should explore clinician and family preferences for obesity treatment options and understand how families balance trade-offs between treatment attributes such as time, cost, safety, uncertainty, and short- and long-term effectiveness. Implementation work is needed to improve treatment access. Further, consistent documentation of nonpharmaceutical treatment will aid surveillance. Continued monitoring of obesity treatment in this population is needed given the rapid changes in evidence, approvals, and access to evidence-based obesity treatments.

Abbreviations

AAP: American Academy of Pediatrics
ADHD: Attention-Deficit/Hyperactivity Disorder
BMI: body mass index
CDC: Center for Disease Control and Prevention
EHR: electronic health record
GLP-1 RA: glucagon-like peptide 1 receptor agonist
ICD: *International Classification of Diseases*
IHBLT: intensive health behavior and lifestyle treatment
ITS: interrupted time series
OR: odds ratio
SNOMED-CT: Systematized Nomenclature of Medicine - Clinical Terms
T2D: type 2 diabetes

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