Prevention and Treatment of Childhood Obesity: Care Received by a State Medicaid Population

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Abstract

Based on chart review for a representative cluster sample of North Carolina Medicaid enrollees aged 3 to 5 years (n = 1951) and 13 to 16 years (n = 1922) years, this study describes prevalence, practice patterns, and comorbidities related to overweight/obese immediately prior to 2007 Expert Recommendations. In total, 16% of children in both age groups were overweight, and 20% (ages 3–5 years) and 25% (ages 13–16 years) were obese. For 3- to 5-year-olds, body mass index percentile was infrequently recorded (22%) or plotted on growth charts (24%), and weight status category was rarely documented (10%). Results were similar for adolescents (21%, 20%, and 12%, respectively). In both groups, documentation of counseling in nutrition or physical activity was rare (16% for ages 3–5 years; 7% for ages 13–16 years). In adolescents, approximately 20% received recommended laboratory screening and overweight/obesity was significantly associated with chart-documented asthma, back pain, prediabetes, gastroesophageal reflux disease, hypertension, and sleep apnea. Whether improvements in documentation of care followed these new guidelines deserves further research.

Keywords

childhood obesity prevention; children; adolescent; obesity; overweight; physical activity; nutrition; youth; low income

Introduction

In 2007, an Expert Committee established clinical recommendations standardizing the prevention, assessment, and treatment of child and adolescent overweight and obesity.[1] The Committee also redefined weight categories, replacing "at risk for overweight" with

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"overweight," and "overweight" with "obese."[1] In this article, we use the term *obesity* generally to refer to overweight and obesity.

The 2007 recommendations stress that primary care providers annually assess body mass index (BMI) percentile for age and gender, as outlined by the Centers for Disease Control and Prevention (CDC) in 2000.[2] Key additional recommendations were annual assessment of nutrition, and physical activity (PA) habits *for all children* starting at age 2 years and following a staged management approach.[1] The United States Preventive Services Task Force (USPSTF) recently endorsed screening and treatment for children older than 6 years.[3] The first step toward implementing the 2007 recommendations is to understand baseline practice and identify gaps in "usual care."

Although routine BMI measurement has been previously recommended,[4,5] studies show that many providers do not routinely use BMI screening[6–10] suggesting that implementing screening might demand new office processes. However, to direct and prioritize implementation and further develop office supports, we need to understand how practices meet or fall short of recommendations. Additionally, children insured by Medicaid who are less likely to have obesity identified and are at increased risk for obesity and related comorbidities, may particularly experience gaps in care and potentially incur tremendous obesity-associated future cost.[7,11]

From a sample representative of the North Carolina pediatric Medicaid population aged 3 to 5 and 13 to 16 years, the main objective of this study was to describe providers' practice patterns for childhood obesity screening and management immediately prior to the 2007 recommendations; secondarily we describe prevalence of overweight, obesity, and associated comorbidities and areas of care where improvement is needed to meet 2007 recommendations.

Methods

We reviewed the primary care medical records of a representative sample of North Carolina Medicaid recipients aged 3 to 5 years (we term *preschoolers*) and 13 to 16 years (we term *adolescents*) to assess baseline care practices for childhood obesity, prevalence, and documentation of comorbid conditions prior to the recommendations. These 2 age groups were chosen to represent select age groups for intervention (preschool and early adolescent). A 2-stage cluster random sample design identified sample populations representative of children insured by Medicaid across North Carolina: Stage 1 was a random cluster sample of providers; Stage 2 was a random sample of patients within providers. In Medicaid administrative data, "provider" may refer to a single physician or larger practice.

Sample Selection Criteria

Study eligibility required continuous Medicaid enrollment for 11 months during calendar year (CY) 2006, and ages 3 to 5 or 13 to 16 years as of January 1, 2007. Figure 1 shows a flow chart depicting sample selection.

For the preschool sample, Medicaid administrative data were used to identify patients who had a well visit with a NC provider during 2006. A total of 131 957 children aged 3 to 5 years were enrolled in 2006 for 11 months; 86 674 patients meeting sample eligibility criteria were seen by 1089 providers. The sampling target of 25% of patients per provider resulted in a sample pool of 86 669 patients served by 974 providers. For patients with well visits by multiple providers, we considered the primary care provider (PCP) to be the provider with the most total visits for the patient (or for a tie, the most recent). We used a cluster sampling design to reach a target number of 2000 charts for abstraction. PCPs were

selected in random order, and a random sample of 25% of the PCP's eligible charts was reviewed, until the target number was reached.

For the adolescent sample, Medicaid administrative data were used to identify patients who had an office visit during 2006. Because well visits occur less frequently in this age group, we allowed any type of visit with a provider type of: pediatrician, general or family practice, multispecialty, nurse practitioner, physician assistant, federally qualified health center (FQHC), rural health clinic (RHC), or health department (HD). A total of 95 217 adolescents were enrolled in 2006 for   11 months; the 62,642 meeting all sample eligibility criteria were seen by 1,630 providers. For patients seen by multiple qualifying providers, the PCP was identified as the most frequent outpatient visit biller (or, for a tie, the most recent). A cluster sampling design targeted 1,940 charts for abstraction. Identified PCPs were selected in random order, and a random sample of 50% of eligible charts was reviewed within each PCP, until the target number was reached.

Between October 22, 2007 and January 21, 2008, 1954 charts from preschoolers and 2029 from adolescents were abstracted. After exclusions for pregnancy, unknown provider, and no visit record found on or after January 2005, final samples included 1951 children from 87 providers and 1922 adolescents from 111 providers (Figure 1).

Medical Record Review

Medical records were reviewed at medical offices. Michigan Peer Review Organization, the state-contracted external quality review organization, developed the abstraction tool in cooperation with the North Carolina Division of Medical Assistance (NCDMA). Q Mark Inc. built the electronic abstraction tool and trained nurses in chart abstractions. This study was performed as a quality improvement activity of NCDMA, and exempted for review by the University of North Carolina Office of Human Research Ethics and the East Carolina University Medical Center Institutional Review Board.

Definitions and Measures

Age on January 1, 2007 was used for sample inclusion; for analyses, age was calculated based on the date of the most recent office visit. PCP specialty was determined by the self-identification of the billing practice in Medicaid administrative data. Providers were classified as urban if located in a county with population density of >200 persons/square mile, according to US Census 2000 data; all others were classified as rural. Patient race/ethnicity was abstracted from the chart; or if unreported in the chart, identified according to self-reported race/ethnicity in Medicaid enrollment data.

BMI was calculated using the most recent visit where height and weight were both recorded. If height and weight were not recorded within 1 year of the most recent office visit, BMI was considered missing (n = 167 children; n = 574 adolescents). Weight status category was defined using current CDC definitions based on the child's BMI percentile for gender and age: underweight <5th percentile, healthy weight 5th to 84th percentile, overweight 85th to 94th percentile, and obese   95th percentile.[12,13] Blood pressure percentile was determined from the most recent blood pressure and height documented.[14]

Charts were reviewed for documentation of BMI calculation, plotting on growth curves, and weight status categorization at any visit within one year of the most recent visit. Medical record documentation within a year was used for documentation of nutrition assessment or guidance, PA or sedentary time assessment or guidance, and any of nine specific messages related to lifestyle, including: 60 minutes of daily PA; fruit and vegetable consumption; daily breakfast; family meals; limiting sugar-sweetened beverages, restaurant and fast food

eating, and portion size; restricting television and other screen time to 1 to 2 hours per day; and removing television and computer screens from child's primary sleeping area (as per 2007 recommendations).[1] Diagnoses and symptoms were coded as present if documented in any problem list or visit note, looking back to birth for preschoolers and to age 10 years for adolescents. Family history, referral to external sites for obesity treatment, and recommended laboratory screening were credited if documented in the chart at any point in time.

Data were analyzed using SAS versions 9.1 and 9.2 (SAS Institute, Cary, NC). The sample was weighted to adjust for the probability of selection at each stage of sampling and for unit nonresponse. Analyses accounted for the clustering of patients within providers. Reported 95% confidence intervals are based on the weighted frequencies. For significance testing, the F-adjusted Rao–Scott χ^2 test was used if the cluster design correction value was positive, the F-adjusted modified Rao–Scott χ^2 test was used if negative.

Results

Characteristics of the sample population and provider practice types are shown in Table 1. Greater than half were black or Hispanic, consistent with North Carolina Medicaid enrollment. Children were seen in diverse practice settings; more than half were seen in a pediatric practice, and half or fewer were seen in a rural location.

Documented care practices related to the 2007 recommendations are shown in Table 2. Among preschoolers, more than 90% of charts had a documented height and 100% had documented weight; for adolescents, height and weight were documented for 71% and 96%, respectively. However, in preschoolers, only 22% of charts had a BMI percentile recorded, and only 24% were plotted on a growth chart; weight status category was rarely noted (10%). Results were similar among adolescents (21%, 20%, and 12%, respectively). Nutritional assessment was documented for 80% of preschoolers and 58% of adolescents. About half of both groups had assessment of PA documented. Screening for obesity family history was noted in roughly 10% of charts for both groups. Only 16% of preschoolers and 7% of adolescents had documented counseling in any of 9 specific guideline-recommended areas.

Care practices varied by practice type (Table 3). Although all children were likely to have height and weight recorded, those seen in a HD were far more likely to have a BMI graph in the chart, BMI percentile recorded, and BMI plotted. For example, BMI was plotted for 90% of preschoolers seen in HDs, 26% seen in FQHC/RHC, 19% seen by a pediatric practice, and 4% seen by a family medicine practice ($P < .001$). Weight status category was not commonly documented among all practice types, with a low of 5% for pediatrics and high of 29% for HDs. Among patients seen in HDs, FQHC/RHCs, and pediatric practices, all indicators of weight assessment, as well as nutrition and PA assessment/guidance, tended to be less commonly documented for adolescents than for preschoolers. However, for patients in family medicine practices the opposite pattern occurred—adolescents generally had higher rates of documented weight status category assessment and behavior assessment/counseling than preschoolers.

For the subset of patients with height and weight available to calculate BMI (1784 preschoolers, 1348 adolescents), weight status category distribution and demographic characteristics are shown (Table 4). In comparing characteristics of those with and without data to calculate BMI, there were statistically significant differences for race and practice type (ages 3–5 years) and gender and provider location (ages 13–16 years; data not shown).

Overall, 1 in 5 preschoolers and 1 in 4 adolescents were obese. An additional 16% of children in both age groups were overweight.

In both age groups, less than a third of overweight/obese children had BMI percentiles documented or plotted or had weight status category noted (Table 5). Most children had documented nutritional assessment/counseling; roughly 60% had documentation of PA assessment/counseling; few had nutrition referrals. About 1 in 10 charts had documentation of obesity family history; about 60% of charts had documentation of family history related to obesity comorbidities. Approximately 20% to 25% of overweight/obese adolescents received laboratory screening consistent with 2007 recommendations (glucose, cholesterol, and AST [aspartate aminotransferase], or ALT [alanine aminotransferase]).[1]

Among adolescents, overweight/obesity was significantly associated with chart-documented asthma, back pain, prediabetes, gastroesophageal reflux disease, obstructive sleep apnea, acanthosis nigricans, and diagnosed hypertension (Table 6). The most recent blood pressure was >90th percentile for age and height for 16% of healthy weight adolescents and 34% of overweight/obese adolescents ($P < .001$). A similar comparison of chart-documented conditions in preschoolers by weight status category did not show significant increases (data not shown).

Discussion

This study describes recent prevalence of childhood obesity in the North Carolina Medicaid population and documentation of care practices related to it. When children in North Carolina are above healthy weight, they are more likely to be obese (20%) than overweight (16%). This is not true nationally where rates of overweight (15%) and obesity (17%) are more evenly matched.[15] Obesity was most prevalent among Hispanic preschoolers (25%) and among American Indian adolescents (32%). Notably, in the Hispanic subgroup, half of the adolescents were above healthy weight, exceeding national averages.[15] Additionally, our assessment of care practices for evaluation and management shows tremendous gaps when compared with 2007 recommendations.

Many opportunities for obesity screening were missed as part of "usual care" in 2006, and assessment, counseling, and evaluation were not typically documented. Even in obese children, recommendations for behavior change were not routinely documented. Particularly among overweight adolescents, many "adult" comorbid conditions were present at alarming rates: 1 in 10 had visits for back pain, and 1 in 3 had a blood pressure reading >90th percentile. Given that majority of children at highest risk for obesity-related complications are insured by Medicaid, these findings portend a tremendous future burden of disease, comorbidity, and cost in this vulnerable population and call for improved detection and intervention.

The study methods have several limitations. Although the study population is representative of the North Carolina Medicaid children aged 3 to 5 and 13 to 16 years, results cannot be generalized beyond the Medicaid system and these age groups. However, North Carolina is a large and diverse state in population density, topography, and racial/ethnic population. Another limitation is reliance on documentation to assess care practices and comorbid conditions. Practitioners may have provided accurate assessment and more counseling during visits than was documented. This study was designed to assess gaps in care and documentation just prior to the 2007 recommendations,[1] but it is important to note that the time period of the review predates the release of these recommendations. It would be unfair to retroactively criticize based on new standards. Rather, this study is useful to understand what "usual care" had been and to direct future efforts to meet the standards.

Despite limitations, our results detect markedly low documentation of BMI and child weight status category: Less than a quarter of children have appropriate documentation. In previous studies, physicians cite multiple reasons for not measuring BMI or addressing obesity, including lack of knowledge of recommendations or skills, perceived ineffectiveness of counseling, lack of treatment options, patient and parent resistance to behavioral change, higher priority health concerns, time constraints, and poor reimbursement.[6,7,10,16–19] Several of these issues are addressed with the clarification of recommended care as provided in the 2007 recommendations and with emerging changes in reimbursement policies.[1,11] In recent years, recognition of obesity as necessitating treatment has led to improved reimbursement by many payers.[11] Medicaid in North Carolina now recognizes obesity diagnosis for treatment and reimburses for up to 6 nutrition visits annually for the purpose of weight management.

Providing supporting tools may also help alleviate the gap. Polacsek et al[20] investigated a primary care intervention for detection and management of obesity and showed that provider use of a treatment algorithm increased BMI documentation and weight classification. Several tools are now available to provide similar supports.[21,22] Since the time of this study, leaders in North Carolina have assembled treatment tools to address these barriers, including a modified treatment algorithm and supporting toolkit.[23] Further studies are needed to show what beyond practice resources, such as training or support, will be needed to effect practice changes and improve outcomes.

Our results do show interesting variation in care documented by different practice types in weight categorization assessment, with more consistent documentation in HDs. We suspect that this reflects incorporation of care protocols or standardized documentation systems across the HD system and may point to systematic approaches to obesity to achieve consistency. Given that documenting weight status category, and providing behavior change counseling have been included in Healthcare Effectiveness Data and Information Set (HEDIS) measures since 2009, the need for office supports for care practice and documentation will likely be of growing interest to pediatric providers and health plans.[24]

Though documentation of nutritional counseling was better than for PA, especially for preschoolers, the striking lack of documentation of counseling for behavior change, even in obese children, suggests that improvements are needed. When looking for evidence that specific targeted messages were delivered, we gave credit for *any* 1 of 9 key items, so even a brief provider notation of "advised decrease TV," "less soda," or "increase PA," would have counted. This criterion was met in fewer than 20% of charts, suggesting that even basic behavior change counseling may not be occurring or at least is not recorded for reference at subsequent visits.

Meeting the needs of the growing population of overweight children may also require new ways of using visits, such as not relying exclusively on well visits to complete basic screenings, identify children needing intervention, and deliver brief targeted messages. In Michigan's Medicaid population, researchers showed that adolescents are seen more frequently for problem-focused rather than well visits,[25] suggesting relying on well visits will miss opportunities to detect obesity. Consequently, intervention would be delayed, and adolescents will be more likely to develop comorbidities.[6–9,16,26]

Conclusions

The North Carolina pediatric Medicaid population has a high burden of obesity and comorbid conditions. If judged by recommendations issued the following year and based on chart documentation, usual screening and counseling practices for children in this population

fall short of recommended care. Whether documentation reflects actual practice and whether practice patterns changed following the new recommendations deserves further research. Systems that help physicians screen children; document screening; take focused nutrition, PA, and family histories; and offer brief, motivational counseling are needed to lessen the gap between actual and recommended care.

Acknowledgments

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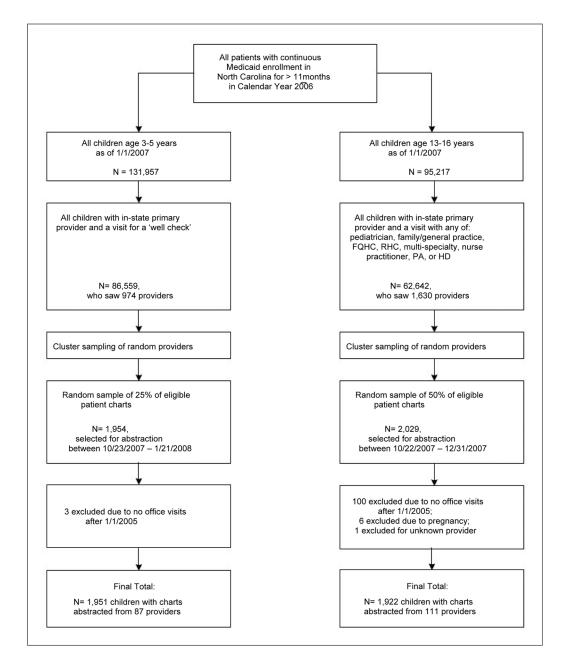
Figure 1.
Sample selection
Abbreviations: FQHC, federally qualified health center; RHC, rural health center; PA, physician assistant; HD, health department.

Table 1

Description of Study Population[a]

Characteristics	Ages 3–5 Years (n = 1951)		Ages 13–16 Years (n = 1922)	
	n (Weighted %)	95% CI	n (Weighted %)	95% CI
Gender				
Female	993 (51)	48–54	933 (49)	46–51
Race/ethnicity				
White (non-Hispanic)	642 (33)	24–42	735 (38)	27–49
Black (non-Hispanic)	722 (37)	27–46	874 (46)	35–56
Hispanic, any race	521 (27)	18–36	87 (5)	2–7
Other, unreported	66 (3)	2–4	63 (3)	2–4
American Indian or Alaska Native	Included in "Other" because of small number		163 (9)	0–23
Practice type				
Pediatric	1007 (52)	33–72	1193 (62)	46–77
Family medicine	209 (11)	3–20	321 (17)	8–26
FQHC/RHC	292 (15)	0–31	175 (9)	3–15
Health department	213 (10)	2–19	121 (7)	2–12
Unknown	230 (12)	0–25	112 (6)	0–11
Geographical location				
Rural	998 (51)	31–70	770 (40)	22–59

Abbreviations: CI, confidence interval; FQHC, federally qualified health center; RHC, rural health center.

[a] Percentages may not add to 100 because of rounding.

Table 2

Care Practices Related to 2007 Expert Committee Universal Recommendations[a]

Recommended Care Practice Within the Past Year	Weighted % (95% CI)	
	Ages 3–5 Years (n = 1951)	Ages 13–16 Years (n = 1922)
Height recorded	92 (90–94)	71 (64–78)
Weight recorded	100 (99–100)	96 (93–99)
BMI graph in the patient record (complete or blank)	53 (37–69)	52 (37–67)
BMI percentile for age/gender recorded in the chart	22 (12–32)	21 (10–32)
BMI plotted on a growth chart	24 (12–35)	20 (12–28)
Weight status category noted	10 (6–14)	12 (9–15)
Nutrition assessment/guidance	80 (71–89)	58 (47–69)
Physical activity or sedentary time assessment/guidance	50 (38–62)	46 (33–59)
Documentation of assessing family history		
Obesity family history	9 (4–14)	12 (6–17)
Other family history[b]	57 (45–70)	50 (41–59)
Documentation of any 9 specific guideline-recommended messages[c]	16 (6–25)	7 (3–10)

Abbreviations: CI, confidence interval; BMI, body mass index.

[a]Percentages may not add to 100 because of rounding.

[b]Other family history includes a family history of type 2 diabetes mellitus, hypertension, hypercholesterolemia, heart disease, and stroke.

[c]Nine specific guideline-recommended messages include encouraging 60 minutes of daily physical activity, fruit and vegetable consumption, eating breakfast daily, family meals; limiting sugar-sweetened beverages, restaurant and fast food eating, portion size, television and other screen time to 1 or 2 hours per day; and removing television and computer screens from child's primary sleeping area.

Table 3

Care Practices Related to 2007 Expert Committee Universal Recommendations by Practice Type[a]

Recommended Care Practice Within the Past Year	Pediatrics (%)	Family Medicine (%)	FQHC/RHC (%)	Health Department (%)	Other (%)	p[b]	Rural (%)	Urban (%)	p[b]
Ages 3–5 years									
Height recorded	90	88	96	98	91	.003	91	92	.51
Weight recorded	99	100	100	100	100	N/A[c]	100	99	N/A[c]
BMI graph in the patient record (complete or blank)	56	20	69	99	11	<.001	52	54	.92
BMI percentile for age/gender recorded in the chart	16	11	33	73	1	<.001	23	21	.84
BMI plotted on a growth chart	19	4	26	90	0	<.001	32	15	.09
Weight status category noted	5	7	21	29	4	<.001	11	9	.72
Nutrition assessment/guidance	82	46	89	96	79	.001	75	85	.17
Physical activity or sedentary time assessment/guidance	56	19	65	72	15	<.001	37	64	<.001
Documentation of assessing family history									
Obesity family history	7	4	10	31	3	<.001	10	9	.87
Other family history[d]	62	57	40	88	32	.02	51	64	.30
Documentation of any 9 specific guideline-recommended messages[e]	10	4	44	33	0	<.001	14	17	.78
Ages 13–16 years									
Height recorded	71	74	78	66	56	.57	63	76	.03
Weight recorded	98	99	99	83	76	<.001	95	97	.57
BMI graph in the patient record (complete or blank)	56	37	45	60	49	.65	60	46	.29
BMI percentile for age/gender recorded in the chart	22	16	23	34	7	.61	25	19	.60
BMI plotted on a growth chart	18	19	22	39	16	.42	18	21	.75
Weight status category noted	12	10	12	17	12	.82	9	14	.06
Nutrition assessment/guidance	60	43	70	59	53	.32	60	57	.80
Physical activity or sedentary time assessment/guidance	47	41	61	48	32	.60	48	45	.84
Documentation of assessing family history within the past year									

Recommended Care Practice Within the Past Year	Pediatrics (%)	Family Medicine (%)	FQHC/RHC (%)	Health Department (%)	Other (%)	P^b	Rural (%)	Urban (%)	P^b
Obesity family history	9	10	19	22	28	.25	12	11	.82
Other family history[d]	48	45	41	68	73	.08	47	52	.53
Documentation of any 9 specific guideline-recommended messages[e]	7	5	5	6	7	.90	4	9	.04

Abbreviations: BMI, body mass index; FQHC, federally qualified health center; RHC, rural health center; N/A, not available.

[a] Percentagess may not add to 100 because of rounding.

[b] F-adjusted Rao–Scott χ^2 P value.

[c] The F-adjusted Rao–Scott χ^2 P value could not be calculated because of zero frequency counts in one or more table cells.

[d] Other family history includes a family history of type 2 diabetes mellitus, hypertension, hypercholesterolemia, heart disease, and stroke.

[e] Nine specific guideline-recommended messages include encouraging 60 minutes of daily physical activity, fruit and vegetable consumption, eating breakfast daily, family meals; limiting sugar-sweetened beverages, restaurant and fast food eating, portion size, television and other screen time to 1 or 2 hours per day; and removing television and computer screens from child's primary sleeping area.

Table 4

Weight Status Category Prevalence Among Medicaid-Enrolled Children[a,b]

| | n | | Weighted % (95% CI) | | |
		Underweight[b]	Healthy Weight[b]	Overweight[b]	Obese[b]
Ages 3–5 years					
Total	1784	5 (4–6)	60 (56–63)	16 (13–18)	20 (18–22)
Gender					
Male		4 (3–5)	62 (58–66)	15 (12–17)	20 (17–22)
Female		5 (4–7)	58 (54–62)	17 (14–20)	20 (18–23)
Race/ethnicity					
White (non-Hispanic)		5 (3–8)	60 (55–66)	17 (13–21)	18 (14–21)
Black (non-Hispanic)		6 (5–8)	62 (59–66)	13 (10–16)	19 (16–22)
Hispanic, any race		2 (1–3)	55 (48–61)	18 (15–21)	25 (21–30)
Other, unreported		5 (0–10)	68 (56–80)	17 (3–30)	11 (2–19)
Geographical location					
Rural		5 (3–6)	58 (53–64)	17 (13–21)	21 (18–24)
Urban		5 (3–6)	62 (57–66)	15 (12–17)	19 (16–23)
Ages 13–16 years					
T otal	1348	3 (2–4)	56 (53–58)	16 (14–18)	25 (23–28)
Gender					
Male		3 (2–4)	56 (51–60)	15 (13–18)	26 (23–30)
Female		3 (2–4)	56 (52–60)	17 (15–20)	24 (21–27)
Race/ethnicity					
White (non-Hispanic)		4 (3–6)	57 (52–62)	14 (11–16)	25 (21–29)
Black (non-Hispanic)		1 (1–2)	57 (53–61)	18 (15–21)	24 (21–27)
Hispanic, any race		3 (0–7)	47 (34–60)	24 (12–37)	26 (15–37)
Other, unreported		8 (1–16)	53 (39–66)	14 (5–22)	26 (13–39)
American Indian or Alaska Native		4 (2–6)	50 (43–56)	14 (8–21)	32 (25–39)
Geographical location					
Rural		2 (1–4)	53 (50–56)	16 (13–19)	28 (25–32)

| | n | | Weighted % (95% CI) | | |
		Underweight[b]	Healthy Weight[b]	Overweight[b]	Obese[b]
Urban		3 (2–4)	57 (54–61)	16 (14–19)	23 (21–26)

Abbreviations: CI, confidence interval; BMI, body mass index.

[a] Analysis limited to those for whom BMI could be determined from medical record.

[b] Percentages may not add to 100 because of rounding.

[c] Underweight = BMI <5th percentile; healthy weight = BMI 5th to 84th percentile; overweight = BMI 85th to 94th percentile; obese = BMI 95th percentile.

Table 5

Care Practices Received by Overweight/Obese Medicaid-Enrolled Children[a,b,c]

Recommended Care Practice Within the Past Year	Weighted % (95% CI)	
	Ages 3–5 Years (n = 638)	Ages 13–16 Years (n = 562)
BMI graph in the patient record (complete or blank)	57 (41–74)	58 (42–73)
BMI percentile for age/gender recorded in the chart	25 (13–36)	32 (16–49)
BMI plotted on a growth chart	29 (15–43)	29 (17–41)
Weight status category noted	16 (9–23)	27 (22–33)
Nutrition assessment/guidance	83 (73–92)	71 (60–81)
Physical activity or sedentary time assessment/guidance	54 (43–66)	62 (49–75)
Documentation of assessing family history		
Obesity family history	11 (6–17)	13 (7–20)
Other family history[d]	59 (45–72)	58 (49–66)
Documentation of any 9 specific guideline-recommended messages[e]	20 (8–32)	12 (6–18)
Referral to nutritional counseling	16 (2–30)	12 (7–17)
Glucose screening	N/A	25 (21–29)
Cholesterol screening	N/A	22 (17–27)
AST or ALT screening	N/A	20 (15–24)

Abbreviation: CI, confidence interval; BMI, body mass index; N/A, not available; ALT, alanine aminotransferase; AST, aspartate aminotransferase.

[a] Analysis limited to those for whom BMI could be determined from medical record.

[b] Underweight = BMI <5th percentile; healthy weight = BMI 5th to 84th percentile; overweight = BMI 85th to 94th percentile; obese = BMI 95th percentile.

[c] Percentages may not add to 100 because of rounding.

[d] Other family history includes a family history of type 2 diabetes mellitus, hypertension, hypercholesterolemia, heart disease, and stroke.

[e] Nine specific guideline-recommended messages include encouraging 60 minutes of daily physical activity, fruit and vegetable consumption, eating breakfast daily, family meals; limiting sugar-sweetened beverages, restaurant and fast food eating, portion size, television and other screen time to 1 or 2 hours per day; and removing television and computer screens from child's primary sleeping area.

Table 6

Select Patient Symptoms and Diagnoses by Weight Status Category, Ages 13–16 Years[a]

Symptoms/Diagnosis[b]	Healthy Weight[c] (n = 746)		Overweight/Obese[c] (n = 562)		
	n	Weighted %	n	Weighted %	p[d]
Acanthosis nigricans	2	0	19	3	<.001
Asthma	123	16	132	23	.002
Back pain	44	6	59	10	<.001
Depression	66	9	56	10	.40
Pre–diabetes mellitus	1	0	7	1	.02
Diabetes mellitus type 2	0	0	5	1	N/A[e]
Dyslipidemia	2	0	5	1	.23
GERD	24	3	35	6	.01
Headache	207	27	188	33	.02
Blood pressure >90th percentile[f]	68	16	104	34	<.001
Hypertension	7	1	27	5	<.001
Sleep apnea	2	0	16	3	<.001

Abbreviations: N/A, not available; GERD, gastroesophageal reflux disease; BMI, body mass index.

[a] Percentagess may not add to 100 because of rounding.

[b] All categories under this column (except blood pressure >90th percentile) were established symptoms/diagnoses recorded in the chart.

[c] Underweight = BMI <5th percentile; healthy weight = BMI 5th to 84th percentile; overweight = BMI 85th to 94th percentile; obese = BMI   95th percentile.

[d] F-adjusted Rao–Scott χ^2 P value.

[e] Significance testing not done because of values of 0 in relevant cells.

[f] Based on most recent blood pressure measurement recorded in chart. Not available for 314 healthy weight children and 252 overweight/obese children.