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Association of Adolescents' BMI classification with preventive clinical care receipt

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Abstract

Purpose.—To examine differences in screening and advising for modifiable risk behaviors during well visits based on adolescents' body mass index (BMI) categories.

Methods.—Retrospective analyses were conducted with NIH NEXT Generation Health Study data, a nationally representative cohort of 10th graders. In wave 1 (2010), adolescents were classified as being underweight (<4.99th percentile), normal weight (5-84.99th percentile), overweight (85-94.99th percentile), or with obesity (≥95th percentile) based on the BMI categories described by the Centers for Disease Control and Prevention. In wave 2 (2011), adolescents were asked whether a provider asked if they smoked, drank alcohol, used other drugs, were sexually active, about nutrition and exercise, and whether they were advised about risks associated with these behaviors.

Results.—The sample consisted of 1,639 eligible participants: 57.8% females, 63.3% 16-yearolds, 47.8% non-Hispanic Whites, 41.5% living in the South, 75.4% with health insurance, 29.8% with low family affluence. Screening rates for overweight compared to normal weight males were 51% reduced for smoking, 46% for alcohol use, 47% for other drug use, 57% for nutrition, and 47% for exercise. Screening rates were 40% reduced for other drug use for males with obesity and 89% reduced for alcohol use for underweight males compared to normal weight males. Advice receipt for females with obesity compared to normal weight females were 90% increased for nutrition, and 78% increased for exercise.

Discussion.—Overweight male adolescents reported being less likely to be screened across almost all preventive service topics representing missed opportunities for care delivery.

Keywords

Adolescent BMI; Provider risk screening/advising; Clinical preventive services receipt; Adolescent Obesity/Overweight

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The American Academy of Pediatrics Bright Futures recommends delivering clinical preventive services that includes screening for and advising adolescents across a range of health-promoting and risk-reducing behaviors as part of annual well-care visits (1). Adolescents who are overweight or have obesity can particularly benefit from preventive care service receipt given their increased engagement in health risk behaviors, including substance use and sexual behaviors, compared to their normal weight peers (2–4). However, prior research indicates that providers' implicit bias and discrimination related to their patients' weight might influence their care delivery (5–7). Gaining a better understanding of whether adolescents' weight status is associated with their receipt of clinical preventive care can help inform strategies to improve the care delivery that all adolescents receive.

Past work that has examined whether preventive care delivery receipt varies by weight status has mainly been conducted with adults (8–14). These studies have focused on the receipt of mainly obesity-related preventive services among individuals who were overweight or had obesity and have had inconsistent findings. For example, some of these studies showed adults who were overweight or had obesity were more likely than normal-weight adults to get preventive care around nutrition and exercise (11), cholesterol screening and diabetes screening (12, 13), influenza vaccination (10), and cancer screening (14). However, other studies showed adult women with obesity were less likely to report a recent mammogram (8) and receive breast and cervical cancer screening (9) than their normal-weight peers. Whether similar lower rates of preventive care receipt are observed for female adolescents has received little attention to date.

Some studies have examined whether preventive care receipt varies by weight status among adolescents (15–19), but we are not aware of any analysis that has stratified findings by sex. Several other factors also limit these studies – they focus mainly on examining nutrition and exercise preventive care receipt rather than also other non-weight related preventive care. These studies have also used cross-sectional rather than prospective data analysis that can assist with disentangling the longitudinal relationship between weight status and preventive care receipt. Also, these studies have relied primarily on less reliable provider coding of obesity (16) or on respondents' self-reports of height and weight to calculate BMI (18, 20) rather than the actual measurement of height and weight to calculate BMI categories. Because of these issues, findings across these studies show inconsistent results. For example, one study that examined 1997-2000 data from the National Ambulatory Medical Care Survey (NAMCS) and the National Hospital Ambulatory Medical Care Survey (NHAMCS) demonstrated adolescents with a diagnosis of obesity (based on provider responses translated into ICD-9 codes) were more likely to be counseled about diet and exercise during well-visits than those without an obesity diagnosis (16). A community-based study involving fifth and sixth-grade students in New Haven, CT, showed that children with obesity were more likely to report receiving counseling on lifestyle factors than their healthy or overweight counterparts (19). Similar results were found in a study among younger adolescents 11-14 years of age, using cross-sectional data from the Children's Use of the Built Environment Study (18). Another study that examined more recent 2005-2006 NHAMCS data did not find differences in screening rates for diet and exercise between adolescents with obesity/overweight and normal-weight adolescents or screening for tobacco use; this study did not examine counseling services (17). Another study

examining 2003-2007 California Health Interview Study data demonstrated variation in screening rates by adolescents' weight status; adolescents with obesity were more likely to be screened for nutrition, physical activity, and emotional distress than normal-weight adolescents, but not for adolescents who were overweight (15).

When considering differences in preventive care receipt by adolescents' weight, we need to consider past work that demonstrates adolescents' receipt of these services, in general, has been found to vary by gender (19, 21, 22), race/ethnicity (23–28), region of residence (29), insurance status (23, 24), and family income (30). For example, regardless of their weight status, female adolescents were more likely to report being counseled about nutrition and physical activity than male adolescents (19) and male adolescents were more likely to be screened by primary care providers for alcohol and other drug use than female adolescents (31). Black and Hispanic youth were more likely to be asked about nutrition than white youth, and uninsured adolescents and those from lower-income groups were more likely to be screened for preventive care than those with insurance or from higher-income groups (24). In addition, preventive care services have been shown to vary by region with California, Colorado, Iowa, Illinois, Oregon, Texas, and Vermont being identified as top performers in preventive care service delivery for adolescents and young adults (29).

This study, designed to address gaps in the literature, prospectively examined the association between adolescents' body mass index (BMI) classification with clinical preventive care receipt one year later, stratified by sex, without and with adjustment for participants' background characteristics, including age, race/ethnicity, region of residence, family income, and insurance status. For this study, we examined the following clinical preventive services: being screened and advised about risks for smoking, drinking alcohol, use of other drugs, sexual behavior, nutrition, and exercise by a provider in the last year. We hypothesized that compared to normal-weight peers, overweight or obese adolescents, particularly female adolescents, would be less likely to report being screened and advised by their provider about preventive services and care one year later, beyond topics related to nutrition and exercise.

Methods

Population and procedures

Data analyses were conducted using the NIH NEXT Generation Health Study (NEXT) data from waves 1 (2010) and 2 (2011). NEXT is a national longitudinal study that collected seven rounds of data from youth starting in 10th grade. NEXT employed a multistage stratified design to recruit a random sample of students enrolled in public, private, and parochial schools in the 50 states and the District of Columbia starting during the 2009-2010 school year that oversampled African American youth but not Hispanic youth since there was an adequate recruited sample of Hispanic youth. Details of the survey design, sampling, and research protocol are described elsewhere (32). During wave 1, data were collected using classroom-based, confidential, self-report questionnaires. During wave 2, data were collected online or with hard copies when participants had limited online access. The original study protocol was approved by the Institutional Review Board of the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development. In addition,

the analysis for this manuscript was approved as exempt by the Johns Hopkins Medicine Institutional Review Board.

Our analytic sample consisted of participants who had data available for the baseline and follow-up surveys (n=2,180), reported a visit within the last year in the follow-up survey (n= 1,691), and had no missing data for preventive service receipt in the follow-up survey (n=1,656) and had no missing data on BMI in the baseline survey (n=1,639).

Measures

Receipt of clinical preventive care by topic.—In wave 2, respondents were asked whether a doctor or nurse asked (screened) them if they smoked, drank alcohol, used other drugs, were sexually active, and about nutrition and exercise, and advised (advice) about risks associated with smoking, drinking, using drugs, sexual behavior, a poor diet, and not exercising. For each service topic, responses were coded as no/yes.

Main indicator variable.—At wave 1, respondents were measured for weight and height by trained research staff (32), and Body Mass Index (BMI) was calculated by dividing the weight in kilograms by the square of their height in meters. BMI percentiles were then calculated using the U.S. Centers for Disease Control and Prevention (CDC) BMI-for-age and sex-specific growth charts (33). For this analysis, BMI was classified as: underweight (<4.99th percentile), normal weight (5-84.99th percentile), overweight (85-94.99th percentile), and with obesity (≥ 95th percentile) (33). Measured weight and height were missing for 81 adolescents; we were able to replace 64 of these missing values using respondents' self-reported weight and height and calculated BMI classification, using the same approach as described immediately above.

Background characteristics.—Respondents were asked about their sex (coded as male/female), age (coded by age group in years: 14 or younger, 15, 16, or 17 and older), race/ethnicity (coded as Hispanic, Non-Hispanic White, Non-Hispanic Black, or Non-Hispanic other race), region of residence (coded as living in the Northeast, Midwest, South, or West), health insurance (coded as insured under one's parents or through school, uninsured, or not known), and family income using the family affluence scale. The Family Affluence Scale developed by the World Health Organization Health Behavior in School-Aged Children Study to assess the socioeconomic status of children/adolescents (30), takes into account 4-items of family wealth: number of family cars, vacations in the past year, home computers, and whether the adolescent had their own bedroom. We calculated a total score across all items that were then categorized as low (0 to 4), moderate (5 to 6), and high (7) family affluence (34).

Data analysis

Descriptive analyses reported for the full sample are weighted. Sample weights combined a base sampling weight which was the inverse of the probability of selection of the participant and an adjustment for nonresponse at the school level and the student level and attrition (32). First, we generated frequencies overall and by respondent's sex, since past studies have demonstrated differences in preventive screening care receipt by sex (23, 24, 31,

35). Chi-square tests were then used to examine the bivariate relationships of receipt of each reported preventive care topic-area with participants' BMI classification stratified by sex. Multivariable logistic regression analyses were then performed to examine the prospective association for each reported preventive care topic area with participants' BMI classification stratified by sex, adjusting for participants' race/ethnicity, region of residence, family income and insurance status. We also explored the interaction between participants' BMI classification and participant background characteristics. All analyses accounted for the complex sampling design, according to NEXT study procedures (32). A 2-sided *p*-value of <0.05 was considered significant. Analysis was performed using Stata software, version 17 (StataCorp. 2021. *Stata Statistical Software: Release 17*. College Station, TX: StataCorp LLC).

Results

In wave 1, the majority of adolescents had BMI classified as obese (19.8%), overweight (19.0%), and normal weight (59.7%), with the remainder being underweight (1.4%). The sample comprised 57.8% females, 63.3% 16-year-olds, 47.8% non-Hispanic Whites, 41.5% living in the South, and 75.4% with health insurance. In addition, about one-third reported a low family affluence score (28.9%).

In wave 2, more than two-thirds of adolescents reported their provider asking about each clinical preventive care (Table 1). Still, less than half reported being advised about smoking, drinking, using drugs, sexual behavior, a poor diet, and not exercising. Visual inspection showed that a higher proportion of female adolescents reported being screened on all topic areas than males. A higher proportion of males reported being advised about smoking, alcohol use, other drug use, and exercise. In comparison, a higher proportion of females reported being advised about sexual behavior and nutrition.

Associations between adolescents' BMI classification and preventive care receipt

Preventive screening care.

After adjusting for male adolescents' background characteristics, multivariable analyses showed screening rates one year later for overweight compared to normal weight males were 51% reduced for smoking (aOR=0.49; 95% CI=0.26-0.91), 46% reduced for alcohol use (aOR=0.54; 95% CI=0.30-0.97), 47% reduced for other drug use (aOR=0.53; 95% CI=0.29-0.97), 57% reduced for nutrition (aOR=0.43; 95% CI=0.21-0.87), and 47% reduced for exercise (aOR=0.53; 95% CI=0.29-0.99) (Table 2). Screening rates one year later for males with obesity compared to normal weight males were 40% reduced for other drug use (aOR=0.60; 95% CI=0.37-0.97) and for underweight males compared to normal weight males were 89% reduced for alcohol use (aOR=0.11; 95% CI=0.01-0.96) (Table 2).

For females, multivariable analyses did not demonstrate significant associations between their BMI classification at baseline and reported provider screening on any topic area one year later (Table 2).

Preventive general advice.—For males, multivariable analyses did not demonstrate significant associations between their BMI classification at baseline and reported provider advice receipt for any topic area one year later (Table 2).

For females, multivariable analyses showed that advice receipt one year later for those with obesity compared to normal-weight participants were 90% increased for nutrition (aOR=1.90; 95% CI=1.11-3.28)) and 78% increased for exercise (aOR=1.78; 95% CI=1.07-2.96) (Table 2). Multivariable analyses did not demonstrate significant associations between females' BMI classification at baseline and reported provider advice on any other topic area one year later (Table 2).

Exploratory analyses that examined the interaction between participants' BMI classification and participant background characteristic for each reported preventive care topic area found that the most consistent factor associated with preventive service receipt was adolescents' family income: overweight adolescents with lower family affluence were more likely to be advised about smoking (aOR=1.89; 95% CI=1.02-3.51), alcohol use (aOR=2.02; 95% CI=1.09-3.77), other drug use (aOR=2.17; 95% CI=1.16-4.06), sex (aOR=1.89; 95% CI=1.01-3.56), and nutrition (aOR=0.53; 95% CI-0.29-0.97) than normal weight adolescents with moderate family affluence.

We found minimal evidence of race/ethnicity by BMI status interaction except for increased screening for sex in other non-Hispanic adolescents with obesity (aOR=10.14; 95% CI=0.99-103.25), increased advising for sex in Hispanic adolescents (aOR=2.12; 95% CI=1.14-3.92) and other non-Hispanic adolescents with obesity (aOR=6.12; 95% CI=1.09-34.27) than non-Hispanic White adolescents who were normal weight. Similarly, we found minimal interaction of insurance status and region of residence by BMI status: overweight individuals with no insurance were more likely to be screened for sex (aOR=2.17; 95% CI=1.06-4.46) than normal weight adolescents with insurance; adolescents with obesity who lived in the Midwest were more likely to be screened for exercise than normal weight adolescents living in the Northeast (aOR=4.02; 95% CI=1.12-14.47).

Discussion

This analysis is one of the first to prospectively examine associations between adolescents' BMI categories and preventive service receipt one year later. After adjusting for participants' background characteristics, we found overweight male adolescents reported being less likely to be screened across almost all topics, males with obesity were less likely to be screened for other drug use, and underweight males were less likely to be screened for alcohol use. Females with obesity were more likely to be advised about nutrition and exercise compared to normal-weight males and females. This study contributes to a larger body of literature that describes how adolescents' weight status might influence care delivery. Study findings highlights the need for future research to better understand the reasons for missed opportunities for preventive care delivery by weight status and sex.

Study results demonstrated disparities in preventive care receipt by adolescents' weight status consistent with past work in this area (15, 16, 18, 19). Findings from this prospective

analysis demonstrate that adolescents' receipt of preventive care screening and advice varies across services based on adolescents' weight status and sex. This study extends past work in that it prospectively examined adolescents' weight status at baseline and preventive care receipt one year later at follow-up and stratified findings by sex. Prospective analyses of relationships in the current study helps to improve upon past work that has been conducted with mainly cross-sectional data and ensures that adolescents' weight status precedes actual report of preventive service receipt in the prior twelve-month period (which would not be the case when using a cross-sectional analytic approach). Longitudinal data is necessary to make any causal inference between youth BMI status and provider behavior. While it is possible a respondent's weight could have substantially changed from baseline to follow-up, it is unlikely over a 1-year period, as research shows that children's developmental trajectories of BMI status by sex remain relatively stable from childhood through adolescence (36).

In the current study, findings were not consistent for all adolescents with higher weight status categories or by sex. For male adolescents, this study found lower rates of preventive services receipt was seen for not only screening for nutrition and exercise but also non-weight-related services for overweight as compared to normal weight male adolescents. We did not find similar findings among male adolescents with obesity except for a lower rate of service receipt for other drug use. Differences observed in preventive care receipt, especially for being screened on nutrition and exercise and among overweight and male adolescents with obesity may be due to factors related to the patient/family and/or provider. For example, health care providers may not take as seriously their overweight males' BMI status, visually assessing them as "normal large-sized" or "husky," or not perceiving BMI as beneficial, especially for more "muscular" male adolescents who may fall into an overweight BMI category (37–39). Other factors such as provider time constraints and other competing needs may also come into play (40). The type of visit, reason for the visit, other identified concerns by the parent, and lack of patient time alone with provider may also influence observed differences (41). Future work should examine whether these study findings hold with other samples of overweight male adolescents and why overweight male adolescents and not males with obesity were less likely to be screened across standard preventive services compared to normal weight male adolescents.

For female adolescents, study findings demonstrated higher rates of advice receipt about nutrition and exercise among female adolescents with obesity compared to normal weight females, but no differences for receipt of any other preventive screening or advice receipt. Higher rates of advice receipt for nutrition and exercise for female adolescents with obesity are consistent with past work that show increased nutrition and exercise counseling for adolescents with obesity in general (15,16,18,19). It is interesting that advice received about nutrition and exercise was found to be high only among females with obesity and not overweight females or overweight or males with obesity. Our exploratory analyses also found adolescents' family income was the most consistent background factor to be prospectively associated with preventive service advice receipt; overweight adolescents with lower family affluence were more likely to be advised across almost all preventive services as compared to normal weight adolescents with moderate family affluence. Future work should focus on better understanding why health care providers might be differentially counseling adolescent patients by sex and weight status, as well as by sex and family income

status, since it is possible providers may be delivering certain services based on assumptions about the prior probability of risk (24).

Overall, study findings showed that preventive care delivery was low for all adolescents, regardless of BMI status, representing missed opportunities for care. Professional medical organizations recommend annual well-visits for all adolescents to include clinical preventive care across a range of health-promoting and risk-reducing behaviors and have shown that delivery of preventive care improves adolescents' health outcomes (1, 42). Despite the established well-visit HEDIS measure (43), we still have much to do to improve adolescents' engagement in well-visits and receipt of preventive care in the U.S (44).Study findings should be considered in light of several limitations. This study began with a high school-based sample, so it may not include adolescents who have dropped out; yet school dropout rates have greatly declined over the past 50 years; when the study began in 2010, dropout rate for ages 16-24 was 8% and 10th graders had the lowest rate (2.5%) (45). Further, the study protocol collected data using innovative internet-based methods to engage students not regularly in school resulting in high recruitment and retention. Next, reports of preventive care receipt were based on adolescent self-report that may be subject to recall bias. However, past studies show that adolescents' self-report on care receipt is highly valid (46). Further, NEXT improves upon limitations of past work in its use of anthropometric measurements of weight and height that were used to calculate and categorize adolescents' weight status rather than use of only self-report weight and height data. Unfortunately, NEXT did not include the types of measures that would allow us to examine the full array of reasons that might have influenced providers' implicit bias and discrimination related to their patients' weight and thus the provider' care delivery, such as characteristics of the visit from the patient perspective (type of visit, reason for the visit, parent concerns, patient time alone with provider), from the provider perspective (time constraints, other competing needs, specialty, level of training, and attitudes towards patients with obesity), or quality of the preventive care service received to better understand why we might be observing disparities in the report of preventive service receipt by sex. Offsetting these limitations is the fact that this is the first prospective study to prospectively examine the association between adolescents' actually measured and calculated body mass index (BMI) class with clinical preventive service receipt one year later in a national sample of adolescents.

This prospective study demonstrated significant gaps in receiving in obesity-related and other preventive care receipt, especially among overweight male adolescents, that represent a missed opportunity for preventive care delivery. Study findings suggest the importance of developing strategies to improve provider screening for high-risk behaviors beyond questions about nutrition/exercise for all adolescents during care visits with particular attention to their BMI status.

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Acronyms

BMI	Body Mass Index
aOR	adjusted Odds Ratio
CI	Confidence Interval

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Implications and Contribution:

This study provides evidence for how adolescents' weight status and sex might influence care delivery. Data reveals significant gaps in weight-related and non-weight-related preventive care receipt in overweight male adolescents, who represent an evolving high-risk group. Study findings suggest the importance of developing sex-specific strategies to improve provider screening for adolescents with non-normal weight status.

Table 1.

Participants' reported preventive care topic-area receipt and sample characteristics among participants who had a well visit in the past year at Wave 2

	Total sample (n=1639)		Males (n=691)		Females (n=948)	
Variables	N[a]	%[b]	N[a]	%[b]	N[a]	%[b]
Outcome: Preventive care area						
Screened about risk behaviors						
Smoking	1125	68.6	451	65.3	674	71.1
Alcohol use	1086	66.3	433	62.7	653	68.9
Other drug use	1096	66.9	437	63.2	659	69.5
Sex	1143	69.7	426	61.7	717	75.6
Nutrition	1237	75.5	512	74.1	725	76.5
Exercise	1255	76.6	536	77.6	719	75.8
General advice on risk behaviors						
Smoking	729	44.5	330	47.8	399	42.1
Alcohol use	702	42.8	314	45.4	388	40.9
Other drug use	707	43.1	318	46.0	389	41.0
Sex	794	48.4	311	45.0	483	50.1
Nutrition	835	50.9	346	50.1	489	51.6
Exercise	828	50.5	350	50.7	478	50.4
Indicator variable:						
Body Mass Index (BMI) classification						
Underweight (BMI 4.99 or less percentile)	23	1.4	14	2.0	9	0.9
Normal weight (BMI 5.00-84.99 percentile)	979	59.7	396	57.3	583	61.5
Overweight (BMI 85.00-94.99 percentile)	312	19.0	115	16.6	197	20.8
Obese (BMI 95.00 or higher percentile)	325	19.8	166	24.0	159	16.8
Background characteristics						
Age in years						
14 or younger	9	0.5	2	0.3	7	0.7
15	454	27.7	166	24.0	288	30.4
16	1038	63.3	452	65.4	586	61.8
17 or older	138	8.4	71	10.3	67	7.1
Race/ethnicity						
Hispanic	499	30.4	229	33.1	270	28.5
Non-Hispanic White	784	47.8	348	50.4	436	46.0
Non-Hispanic Black	293	17.9	93	13.5	200	21.1
Non-Hispanic other	63	3.8	21	3.0	42	4.4
Region of residence						
Northeast	282	17.2	119	17.2	163	17.2
Midwest	254	15.5	112	16.2	142	15.0
South	680	41.5	273	39.5	407	42.9

Variables	Total sample (n=1639)		Males (n=691)		Females (n=948)	
	N[a]	%[b]	N[a]	%[b]	N[a]	%[b]
West	423	25.8	187	27.1	236	24.9
Family affluence score[d]						
Low	474	28.9	196	28.4	278	29.3
Moderate	786	48.0	336	48.6	450	47.5
High	373	22.8	158	22.9	215	22.7
Health insurance[e]						
Insured under parents or other	1236	75.4	115	7.2	165	5.2
Not insured	99	6.0	50	16.6	49	17.4
Do not know	280	17.1	520	75.3	716	75.5

[a] Data are unweighted

[b] Data are weighted

[d] Missing data= 6 cases (0.004%)

[e] Missing data= 24 cases (0.015%)

Table 2.

Adjusted odds ratios and confidence intervals for association between adolescents' BMI classification and preventive screening and general advice receipt by topic area

		Males (n=691)		Females (n=948)	
		Screened	Advised	Screened	Advised
Topic area	**BMI classification**	**aOR[a] (95% CI)**	**aOR[a] (95% CI)**	**aOR[a] (95% CI)**	**aOR[a] (95% CI)**
Smoking	Normal weight	Ref	Ref	Ref	Ref
	Underweight	0.45 (0.12-1.75)	0.15 (0.01-22)	1.79 (0.34-9.43)	1.93 (0.28-13.42)
	Overweight	**0.49 (0.26--.91)** *	0.58 (0.29-.15)	1.09 (0.66-1.79)	1.10 (0.67-1.79)
	Obese	0.98 (0.56-1.73)	0.68 (0.38-.19)	0.78 (0.41-1.48)	1.01 (0.50-2.07)
Alcohol	Normal weight	Ref	Ref	Ref	Ref
	Underweight	**0.11 (0.01-0.96)** *	0.16 (0.01-2.46)	1.92 (0.30-12.43)	2.26 (0.30-17.17)
	Overweight	**0.54 (0.30-0.97)** *	0.58 (0.29-.15)	1.03 (0.63-1.69)	1.14 (0.66-1.97)
	Obese	0.82 (0.48-1.39)	0.63 (0.34-1.17)	0.80 (0.44-1.44)	1.14 (0.55-2.36)
Other drugs	Normal weight	Ref	Ref	Ref	Ref
	Underweight	0.50 (0.12-2.04)	0.22 (0.02-2.10)	1.33 (0.23-7.67)	2.37 (0.32-17.41)
	Overweight	**0.53 (0.29-0.97)** *	0.73 (0.37-1.45)	0.85 (0.49-1.46)	1.03 (0.63-1.69)
	Obese	**0.60 (0.37-0.97)** *	0.77 (0.44-1.32)	0.72 (0.40-1.30)	1.06 (0.52-2.15)
Sex	Normal weight	Ref	Ref	Ref	Ref
	Underweight	0.48 (0.10-2.22)	0.15 (0.01-2.74)	1.33 (0.22-7.84)	1.26 (0.13-11.83)
	Overweight	0.54 (0.26-1.13)	0.61 (0.32-1.13)	1.63 (0.99-2.70)	1.13 (0.69-1.85)
	Obese	0.76 (0.37-1.56)	0.63 (0.37-1.07)	0.64 (0.30-1.37)	0.85 (0.48-1.48)
Nutrition	Normal weight	Ref	Ref	Ref	Ref
	Underweight	0.70 (0.21-2.30)	0.50(0.08-3.25)	1.56 (0.25-9.60)	1.8 (0.18-17.76)
	Overweight	**0.43 (0.21-0.87)** *	0.76 (0.39-1.46)	1.09 (0.71-1.68)	1.24 (0.75-2.032)
	Obese	1.17 (0.57-2.41)	1.10 (0.63-1.93)	0.93 (0.49-1.78)	**1.91 (1.11-3.28)** *
Exercise	Normal weight	Ref	Ref	Ref	Ref
	Underweight	0.44 (0.14-1.38)	0.49 (0.07-3.45)	1.67 (0.32-8.69)	1.45 (0.18-11.78)

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Topic area	BMI classification	Males (n=691)		Females (n=948)	
		Screened	Advised	Screened	Advised
		aOR[a] (95% CI)	aOR[a] (95% CI)	aOR[a] (95% CI)	aOR[a] (95% CI)
	Overweight	**0.53 (0.29-0.99)** *	0.83 (0.40-1.73)	1.52 (0.84-2.74)	1.20 (0.75-1.94)
	Obese	0.87 (0.46-1.62)	1.19 (0.68-2.09)	1.62 (0.91-2.90)	**1.78 (1.07-2.96)** *

BMI=Body Mass Index aOR=Adjusted Odds Ratio CI= Confidence Interval

[a] Data from Multivariable Logistic Regression models (controlling for age, race/ethnicity, region, family affluence, insurance status)

* p value<0.05