

# UC Davis

## UC Davis Previously Published Works

### Title

Weight Status of Children and Adolescents in a Telepsychiatry Clinic

### Permalink

<https://escholarship.org/uc/item/8652v54b>

### Journal

Telemedicine Journal and e-Health, 15(10)

### ISSN

1530-5627

### Authors

Marks, Shayna  
Shaikh, Ulfat  
Hilty, Donald M  
et al.

### Publication Date

2009-12-01

### DOI

10.1089/tmj.2008.0150

Peer reviewed

# Weight Status of Children and Adolescents in a Telepsychiatry Clinic

Shayna Marks, M.A.,<sup>1</sup> Ulfat Shaikh, M.D., M.P.H.,<sup>2</sup> Donald M. Hilty, M.D.,<sup>3</sup> and Stacey Cole, M.B.A.<sup>4</sup>

<sup>1</sup>Department of Psychology and Social Behavior, University of California at Irvine School of Social Ecology, Irvine, California.

<sup>2</sup>Department of Pediatrics, University of California Davis School of Medicine, Sacramento, California.

<sup>3</sup>Rural Program in Medical Education, University of California Davis School of Medicine, Sacramento, California.

<sup>4</sup>University of California Davis Center for Health and Technology, Sacramento, California.

## Abstract

The prevalence of overweight and obesity is approximately 32% among children and adolescents in the United States. Comorbid conditions associated with pediatric overweight and obesity include psychiatric conditions. The purpose of this study was to determine the prevalence of overweight and obesity among children and adolescents presenting for consultation from rural communities to the UC Davis Telemedicine Program (UCDTP), as well as to collect preliminary data to design an integrated disease management program for children and adolescents with obesity and mental illness. Patients aged 21 and under seen for psychiatric consultation at the UCDTP between 2004 and 2006 were included. Retrospective medical record review was conducted to determine the major psychiatric diagnoses, height, weight, body-mass index, and weight status (underweight/at risk for underweight, normal weight, overweight, or obese) for each patient. Of the 230 patients referred, a total of 121 patients had both height and weight values documented. Three patients were underweight; 51 were normal weight; 28 were overweight; 39 were obese. The most common psychiatric diagnoses in the 121 patients were attention deficit/hyperactivity disorder (ADHD;  $n = 40$ ), bipolar disorder ( $n = 36$ ), and depression ( $n = 31$ ). The most common psychiatric diagnoses in patients with available

weight and height data who were overweight and obese were bipolar disorder ( $n = 20$ ), depression ( $n = 18$ ), and ADHD ( $n = 17$ ). Approximately 55% of child and adolescent patients seen for telepsychiatry consultation whose charts documented height and weight measurements were overweight or obese. Psychiatric diagnoses in overweight youngsters need to be researched further to determine whether the weight change is primary or secondary to mood and/or to treatments, such as medication. At such a high rate of comorbidity, monitoring the weight status of young psychiatric patients in this population is indicated.

**Key words:** telepsychiatry, rural children, pediatric overweight and obesity, psychiatric medications

## Introduction

The prevalence of pediatric overweight and obesity in the United States has reached epidemic proportions over the past 3 decades. Although its prevalence shows some variation between age groups, data from the Centers for Disease Control and Prevention indicate that the prevalence of childhood overweight and obesity is approximately 32%.<sup>1-3</sup> Additionally, the overall prevalence of obesity in children residing in rural areas is higher than the prevalence of obesity in the general pediatric population. In studies conducted in rural settings, the range of obesity is 28% (southwestern Oklahoma<sup>4</sup>) to 33% (rural Appalachia<sup>5</sup>) to 54% (Mississippi, overweight or obese<sup>6</sup>). More recently, data from the National Survey of Children's Health (NSCH) demonstrated that overweight or obese children were more likely to live in rural compared to urban areas (OR = 1.252; 95% confidence interval, 1.248, 1.256).

Rural location or residence may not be the only contributing factor in the high prevalence of overweight and obesity in children.<sup>7,8</sup> Obesity has long been associated with low socioeconomic status (SES).<sup>9</sup> Indeed, characteristics of health and healthcare associated with low SES may be true of residents of both rural areas and inner-city

urban areas.<sup>10</sup> However, the NSCH showed that rural children were more likely than their urban counterparts to live in poverty, have no health insurance, have lower preventive healthcare, have more sedentary habits, and have a greater risk of comorbidities.<sup>9</sup> Due to the contributions of socioeconomic, geographic, and health-related challenges faced by residents of rural communities, rural children are at increased risk for obesity and its consequences,<sup>11</sup> possibly even beyond that faced by children in inner-city urban areas.<sup>10</sup>

Obesity and overweight have long been associated with psychiatric and psychological disorders in children. In one study, 58% of obese children studied were diagnosed with at least one psychiatric disorder, especially anxiety disorders.<sup>12</sup> Obese children are at increased risk for societal stigmatization, peer rejection, nonacceptance by adults, decreased self-esteem, and depression.<sup>13</sup> Psychosocial consequences of obesity are especially concerning in children because of the impact on their emotional well-being as young adults.<sup>13,14</sup> Further complicating the issue is the finding that the prevalence of psychiatric disorders may be higher in rural areas compared to urban areas,<sup>15</sup> a pattern that has been associated with a number of factors, including geographical isolation, increased rates of substance use, disability, and unemployment, as well as decreased access to medical and mental healthcare.

Technology plays a critical role in the delivery of mental health services to rural areas, which have lower access to psychiatrists and psychologists. Telemedicine use has expanded rapidly since the 1990s and is becoming an effective means for increasing access to healthcare. Several studies have shown the usefulness of telemedicine in linking experts to rural communities.<sup>16-18</sup> The American Academy of Child and Adolescent Psychiatry has written practice guidelines for the use of telecommunications technologies in working with children and adolescents in the mental health setting.<sup>19</sup> In one such tele-endocrinology service, more than 80% of patients treated by the pediatric weight management specialist showed improvements in their diet, activity level, or weight.<sup>20</sup>

The goal of this present study is to determine the prevalence of overweight and obesity among a group of children and adolescents from rural communities, as defined by the California Office of Statewide Health Planning and Development,<sup>21</sup> presenting for psychiatric consultation delivered by telemedicine; height and weight values were recorded for these youngsters. This study will provide preliminary data to inform the development of an integrated care model for the treatment of comorbid obesity and psychiatric disorder among rural children and their families using telecommunications technology.

## Materials and Methods

### UC DAVIS TELEMEDICINE PROGRAM AND SITES

The University of California Davis Health System (UCDHS) has developed one of the nation's leading telemedicine programs working across over 30 medical specialties. The program provides over 80 outpatient clinics and hospital sites, mostly in rural Northern California, with access to more than 30 medical specialties and has completed over 10,000 video-based clinical consultations to date. Telepsychiatry has accounted for over 2,000 of these consults, delivered to over 28 sites in rural California.

In addition to telepsychiatry consultations, the UCDHS telemedicine program also provides telemedicine weight management consultations to children and adolescents living in rural areas of California. Since 2000, over 500 children and adolescents at 18 rural clinics in California received such consultations from a UCDHS pediatric weight management specialist and dietitian. An earlier medical record review of 99 children and adolescents who received telemedicine weight management consultations revealed that the majority of consultations were associated with changes or additions to diagnoses, diagnostic evaluation, and treatment plans.

### PARTICIPANTS

Individuals ages 21 and under (mean age = 13 years, range = 4–21, standard deviation  $\pm$  4.84; 40.6% female) who were seen for psychiatric consultation in the UC Davis Telemedicine Program between 2004 and 2006 were identified using the UCDHS Telemedicine Clinical Consultation Database.

### PROCEDURES

Telepsychiatry consultations were performed in accordance with the UCDHS telemedicine policies and procedures.<sup>22</sup> Video consultations were performed at 384 kilobits per second by either Internet Protocol or Integrated Services Digital Network.<sup>23,24</sup> Medical records from these visits were reviewed to determine major psychiatric diagnoses, height, and weight for each patient. Only those individuals defined as children by the National Institutes of Health<sup>25</sup> who were under 21 years of age at the time of consultation and had complete information in their consultative record regarding their psychiatric diagnoses, height, and weight were included. Following abstraction of this information, body-mass index (BMI), BMI percentile, and weight status were calculated using the U.S. Department of Agriculture/Agricultural Research Service (ARS) Children's Nutrition Research Center's online BMI calculator.<sup>26</sup>

## DATA ANALYSES

Patient weight status was classified by BMI percentile into underweight, at risk for underweight, normal weight, overweight, or obese according to the Children's Nutrition Research Center's guidelines.<sup>26</sup> The percentage of patients in each weight category was determined and bivariate analyses were conducted to determine the association between presence of psychiatric disorders and weight category (underweight, at risk for underweight, normal, overweight, and obese).

## Results

### DEMOGRAPHIC CHARACTERISTICS

A total of 230 patients, less than 21 years of age, identified by the Telemedicine Consultation Database had been seen by a UCDHS psychiatrist. At the time of this study, medical records of 161 patients were available for review. Of these 161 patients, a total of 121 patients had psychiatric diagnostic information as well as both height and weight values documented at their telepsychiatry visit. Of the 121 children and adolescents included in our analyses, 46 (38%) were female. The mean age of patients included in the study was 13 years ( $SD \pm 4.07$ , age range = 4–21 years).

### WEIGHT CATEGORY AND PSYCHIATRIC DIAGNOSES

Two patients (2%) were underweight and 1 patient (1%) was at-risk for underweight. Fifty-one patients (42%) were of normal weight for age and sex. Twenty-eight patients (23%) were overweight, and 39 (32%) were obese. Psychiatric diagnoses in overweight and obese patients included attention deficit/hyperactivity disorder (ADHD), impulse control disorder, oppositional defiant disorder, conduct disorder, Tourette's syndrome, depression, dysthymia, bipolar dis-

order, schizoaffective disorder, schizophrenia, psychotic disorder not otherwise specified (NOS), autism, Asperger's syndrome, obsessive-compulsive disorder, post-traumatic stress disorder, generalized anxiety disorder, substance abuse disorder, mental retardation, eating disorder NOS, and cognitive disorder NOS. The most common psychiatric diagnosis documented was ADHD, in 40 (33%) of patients. The next most frequently made diagnoses were bipolar disorder ( $n = 36$ ; 30%) and depression ( $n = 32$ ; 26%). These rates did not differ substantially in those individuals for whom no height or weight data were available; the most common diagnoses in the group with missing weight or height data were depression (34%), ADHD/impulse control disorders (27%), and bipolar disorder (27%). The frequency of psychiatric diagnoses by weight category for the 121 patients with available weight and height data is presented in *Table 1*.

### BIVARIATE ANALYSES

Patients with available weight and height data were categorized by weight status, as either underweight/normal weight or overweight/obese. Independent samples *t*-tests were computed between weight status and psychiatric diagnoses. Analyses indicate that underweight or normal weight children are significantly more likely to have ADHD than are overweight or obese children ( $t(106.379) = 1.991$ ,  $p = 0.049$ ). There was a trend toward increased rates of conduct disorder among overweight or obese children compared to normal or underweight children ( $t(98.297) = -1.788$ ,  $p = 0.077$ ). Although more overweight and obese individuals had diagnoses of bipolar disorder or depression than did normal weight or underweight individuals, these differences were not significant. No other relationships between psychiatric diagnosis and weight status were

**Table 1. Frequency of Psychiatric Diagnosis by Weight Category**

	UNDERWEIGHT/AT RISK FOR UNDERWEIGHT		NORMAL WEIGHT		OVERWEIGHT		OBESE		TOTAL N
	N	%	N	%	N	%	N	%	
ADHD	2	66.67	21	41.18	7	25.00	10	25.64	40
Bipolar disorder	0	0.00	16	31.37	8	28.57	12	30.77	36
Depression	1	33.33	12	23.53	7	25.00	11	28.21	31
Other psychiatric diagnoses	0	0.00	2	3.92	6	21.43	6	15.38	14
Total	3	2.47%	51	42.15%	28	23.14%	39	32.23%	121

ADHD, attention deficit/hyperactivity disorder.

significant. When individuals were categorized either as obese or not obese, only psychotic disorders differed by weight status ( $t(81) = 2.293$ ,  $p = 0.024$ ). No other psychiatric diagnoses differed between obese and nonobese children.

## Discussion

Our study found that among patients seen for telepsychiatry consultation, for whom data on psychiatric diagnoses, height, and weight were available, the prevalence of overweight and obesity was 55%. This high prevalence of overweight and obesity seen in our subjects may be reflective of population characteristics in rural areas of California, or in other resource-limited populations who commonly utilize telepsychiatric services.

Published studies indicate a link between obesity and psychiatric disorders, specifically ADHD in adolescents.<sup>27,28</sup> Explanations that have been posited for this relationship are that ADHD symptoms could be correlated with binge eating, bulimia, and emotionally induced eating, which in turn results in obesity.<sup>29,30</sup> Contrary to these findings, our results indicate that in a sample seen for psychiatric consultation, there was a significantly higher rate of ADHD among normal and underweight individuals than among overweight and obese individuals. This is more in line with Curtin and colleagues' finding that the prevalence of obesity in children with ADHD is similar to that of the general population.<sup>31</sup> In our study, there were no statistically significant differences in the rates of the most common psychiatric diagnoses—ADHD, depression, and bipolar disorder—between individuals who were obese and those who were not. Nonetheless, rates of depression and bipolar disorder were higher in overweight and obese children than in normal and underweight children, and a trend toward increased rates of conduct disorder in overweight children compared to normal weight children was observed.

A partial explanation for the relationship of obesity and psychiatric disorders may be that genetic linkage between these disorders exists.<sup>32-34</sup> In addition, it is plausible, as mentioned above, that obesity alters a patient's emotional trajectory due to stigma or that coping/"interventions" from parents misdirects a patient's attempts to cope. On the other hand, mood and other disorders may lead to problems with metabolism and/or eating behaviors that contribute to obesity. Finally, medication treatments (e.g., atypical antipsychotics [quetiapine, olanzapine]) for many psychiatric disorders have a major impact on metabolism and obesity.

## Implications

Actively screening for overweight and obesity in children during all telepsychiatry consultations may facilitate identification and treat-

ment of excess weight that may be common in this population. Additionally, identifying children and adolescents with specific psychiatric diagnoses that may be associated with overweight and obesity may help promote an integrative approach to mental and physical healthcare. However, our study has the following limitations. First, our sample size was small. Second, children and adolescents referred to the telepsychiatry clinic may have unique characteristics compared to either their rural peers or their urban and suburban counterparts. For example, children referred to telepsychiatry may be more likely to be underinsured than other children in the community, and therefore may face additional obstacles to maintaining their health than their peers. Third, because the present study was a retrospective review rather than a prospective trial, our data only indicate an association between specific mental health issues and obesity in the population included, and do not infer causality. Another important limitation is that medical records of 30% of the patients eligible for inclusion in this study were unavailable for review.

## Conclusions

Approximately 55% of children and adolescents presenting for consultation to the UC Davis telepsychiatry clinic, with available data on psychiatric diagnoses, height, and weight, were overweight or obese. Among these patients, underweight or normal weight children were significantly more likely to have ADHD than overweight or obese children. Obese children were more likely to have conduct disorder than underweight or normal weight children. Although overweight and obese children were somewhat more likely than under- or normal weight children to have depression or bipolar disorder, these differences were not significant. While identifying these relationships provides preliminary data to develop an integrative model of treatment for children with comorbid psychiatric issues and obesity seen in telemedicine clinics, further prospective studies are warranted.

## Acknowledgment

Dr. Shaikh's research is funded by a K12 award from the UC Davis Clinical and Translational Science Center (grant # UL1 RR024146 from the National Center for Research Resources [NCRR], National Institutes of Health).

## Disclosure Statement

No competing financial interests exist.

## REFERENCES

- Centers for Disease Control. *Childhood overweight: Overweight prevalence*. Atlanta, Georgia: Centers for Disease Control, 2007.

2. Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States, 1999–2004. *JAMA* **2006**;295:1549–1555.
3. Ogden CL, Carroll MD, Flegal KM. High body mass index for age among US children and adolescents, 2003–2006. *JAMA* **2008**;299:2401–2405.
4. Moore WE, Stephens A, Wilson T, Wilson W, Eichner JE. Body mass index and blood pressure screening in a rural public school system: The Healthy Kids Project. *Prev Chronic Dis* **2006**;3:A114.
5. Crooks DL. Food consumption, activity, and overweight among elementary school children in an Appalachian Kentucky community. *Am J Phys Anthropol* **2000**;112:159–170.
6. Davy BM, Harrell K, Stewart J, King DS. Body weight status, dietary habits, and physical activity levels of middle school-aged children in rural Mississippi. *South Med J* **2004**;97:571–577.
7. Stettler N, Elliott MR, Kallan MJ, Auerbach SB, Kumanyika SK. High prevalence of overweight among pediatric users of community health centers. *Pediatrics* **2005**;116:e381–e388.
8. Welch C, Gross SM, Bronner Y, Dewberry-Moore N, Paige DM. Discrepancies in body image perception among fourth-grade public school children from urban, suburban, and rural Maryland. *J Am Diet Assoc* **2004**;104:1080–1085.
9. Kohrs MB, Wang LL, Eklund D, Paulsen B, O'Neal R. The association of obesity with socioeconomic factors in Missouri. *Am J Clin Nutr* **1979**;32:2120–2128.
10. Jurkowski ET. The challenges of providing care in rural and inner city communities: A case study examining rural Illinois in comparison to inner city Chicago. Paper presented at Association for Health Services Research, **1999**.
11. Janicke DM, Sallinen BJ, Perri MG, et al. Sensible treatment of obesity in rural youth (STORY): Design and methods. *Contemp Clin Trials* **2008**;29:270–280.
12. Vila G, Zipper E, Dabbas M, et al. Mental disorders in obese children and adolescents. *Psychosom Med* **2004**;66:387–394.
13. Schwartz MB, Puhl R. Childhood obesity: A societal problem to solve. *Obes Rev* **2003**;4:57–71.
14. Dietz WH. Health consequences of obesity in youth: Childhood predictors of adult disease. *Pediatrics* **1998**;101(3 Pt 2):518–525.
15. Lishner DM, Richardson M, Levine P, Patrick D. Access to primary healthcare among persons with disabilities in rural areas: A summary of the literature. *J Rural Health* **1996**;12:45–53.
16. Callahan EJ, Hilty DM, Nesbitt TS. Patient satisfaction with telemedicine consultation in primary care: Comparison of ratings of medical and mental health applications. *Telemed J* **1998**;4:363–369.
17. Karp WB, Grigsby RK, McSwiggan-Hardin M, et al. Use of telemedicine for children with special healthcare needs. *Pediatrics* **2000**;105(4 Pt 1):843–847.
18. Whited JD. Tele dermatology: Current status and future directions. *Am J Clin Dermatol* **2001**;2:59–64.
19. American Academy of Child and Adolescent Psychiatry. *Practice parameter for telepsychiatry with children and adolescents*. Washington, DC: American Academy of Child and Adolescent Psychiatry, **2008**.
20. Shaikh U, Cole SL, Marcin JP, Nesbitt TS. Clinical management and patient outcomes among children and adolescents receiving telemedicine consultations for obesity. *Telemed J E Health* **2008**;14:434–440.
21. Office of Statewide Health Planning and Development. Rural Health Policy Council: California's Focal Point for Rural Health—Resources. **2007**. <http://www.oshpd.state.ca.us/RHPC/Resources/Demographics.html> (Last accessed April 2009).
22. Nesbitt TS. *University of California Davis Health System Center for Health and Technology Telehealth Policy and Procedure Manual*. Sacramento, CA: University of California, Davis Health System, **1997**.
23. International Telecommunications Union, Geneva, Switzerland. Recommendation H.3202006.
24. International Telecommunications Union, Geneva, Switzerland. Recommendation H.3232006.
25. National Institutes of Health. Questions and Answers about The NIH Policy and Guidelines on The Inclusion of Children as Participants in Research Involving Human Subjects. **1999**. [http://grants.nih.gov/grants/funding/children/pol\\_children\\_qa.htm#q04name](http://grants.nih.gov/grants/funding/children/pol_children_qa.htm#q04name) (Last accessed April 2009).
26. USDA/ARS Children's Nutrition Research Center. *Children's BMI-percentile-for-age calculator*. **2007**. <http://www.kidnutrition.org/bodycomp/bmiz2.html> (Last accessed March 2, 2008).
27. Hubel R, Jass J, Marcus A, Laessle RG. Overweight and basal metabolic rate in boys with attention-deficit/hyperactivity disorder. *Eat Weight Disord* **2006**;11:139–146.
28. Lam LT, Yang L. Overweight/obesity and attention deficit and hyperactivity disorder tendency among adolescents in China. *Int J Obes (Lond)* **2007**;31:584–590.
29. Cortese S, Isnard P, Frelut ML, et al. Association between symptoms of attention-deficit/hyperactivity disorder and bulimic behaviors in a clinical sample of severely obese adolescents. *Int J Obes (Lond)* **2007**;31:340–346.
30. Davis C, Levitan RD, Smith M, Tweed S, Curtis C. Associations among overeating, overweight, and attention deficit/hyperactivity disorder: A structural equation modelling approach. *Eat Behav* **2006**;7:266–274.
31. Curtin C, Bandini LG, Perrin EC, Tybor DJ, Must A. Prevalence of overweight in children and adolescents with attention deficit hyperactivity disorder and autism spectrum disorders: A chart review. *BMC Pediatr* **2005**;5:48.
32. Muller DJ, Kennedy JL. Genetics of antipsychotic treatment emergent weight gain in schizophrenia. *Pharmacogenomics* **2006**;7:863–887.
33. Murphy DL, Lerner A, Rudnick G, Lesch KP. Serotonin transporter: Gene, genetic disorders, and pharmacogenetics. *Mol Interv* **2004**;4:109–123.
34. Stunkard AJ, Faith MS, Allison KC. Depression and obesity. *Biol Psychiatry* **2003**;54:330–337.

Address correspondence to:

Shayna Marks, M.A.

Department of Psychology and Social Behavior  
University of California at Irvine School of Social Ecology  
3340 Social Ecology Building II  
Irvine, CA 92697

E-mail: shayna.marks@uci.edu

Received: November 20, 2008

Revised: May 13, 2009

Accepted: July 13, 2009