

OVERWEIGHT, OBESITY AND HEALTH-RELATED QUALITY
OF LIFE IN EARLY ADULTHOOD

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INTRODUCTION

Rising levels of obesity are a major problem in the United States. In 1992, 12.0% of adults ages 20 and older were obese (11.7% men, 12.2% women) (Mokdad, Serula, Dietz 1999); by 2012 this figure had risen to 35.1% (33.7 men, 36.5 women) (Ogden et al 2014). Among young adults ages 18 to 29 the increase was just as steep; the obesity rate doubled in the past 20 years from roughly from 12% to 26%. This increasing trend is problematic given that obesity has been linked to a number of serious health conditions such as high blood pressure (Whyte 1959; Chiang, Perlman, and Epstein 1969; Stamler, et al 1978), diabetes (Mokdad, et al 2003), and heart disease (Thompson, Edelsberg, Colditz, et al. 1999). In addition, diseases typically associated with aging such as hypertension and kidney disease are becoming more common among young adults. For example, the prevalence of diabetes has increased 63% among adults aged 20 to 39, compared with 22% for older ages.

As well as affecting the early onset of disease, recent evidence suggests that obesity is associated with a loss in health related quality of life (HRQoL). Health related quality of life is a measure that is used to assess the impact of a chronic condition or disease on an individual's subjective well-being, as well as mental, physical and social functioning (Hennesey 1994). Measures such as health related quality of life have become increasingly important in efforts to assess the health of individuals and populations (NAP 2001).

Negative correlations linking HRQoL and body mass index or body weight category among adults (e.g., Yan, Daviglius, Liu, et al 2004; Barofsky, Fontaine and Cheskin 1997; Ul-Haq, Mackay, Fenwick et al 2013) have been documented by several studies. A recent review of the literature on the relationship between body weight and HRQoL notes different patterns for both physical and mental HRQoL. While both were found to be impaired in obese individuals, mental health impairment was only evident among those at the very highest end of the body weight spectrum. However, a majority of these studies focus on clinical samples of the overweight or obese (Wang, Sereika, Styn et al 2013; Burke et al 2009), or on regional samples (e.g., Huisingsh-Scheetz, Bilir, Rush et al 2013), while relatively few focus on population-based samples. In addition, these studies focus on samples composed of a wide age range (McLaughlin and Hinyard 2014) or examine middle-aged or older adults (Bentley, Palta, Paulsen et al 2011). Little is known about the patterns of HRQoL among young adults in the US, or how it may be related to body weight.

The primary objective of this study is to identify the relationship between body weight and health related quality of life during young adulthood. Using data from the National Longitudinal Survey of Youth 1997, we examine the relationship of overweight and obesity with both physical and mental health related quality of life among a national sample of young adults aged 29.

DATA AND METHODS

Data. In the present study we utilize multiple rounds of the 1997 National Longitudinal Survey of Youth (NLSY97). The NLSY97 is an ongoing panel survey designed to collect information at multiple points in time on the labor market activities and other significant life events of a

national sample of young men and women. The NLSY97 is a nationally representative, longitudinal survey of people born in 1980-84 who were living in the US in 1997.

Health-Related Quality of Life (HRQoL). Our key dependent variables are physical and mental HRQoL. Beginning in round 13, an extended series of health questions were asked when the respondent turned age 29. The series of questions allow the construction of the SF-12 which is a condensed version of the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36). The SF-12 is a common measure to assess physical and mental health and is particularly useful in large population health surveys. The SF-12 consists of 12 items that measure eight health domains: *physical functioning, physical role limitations, general health, bodily pain, mental health, vitality, social functioning, and emotional role limitations.*

The *Physical Component Summary Scale Score (PCS-12)* reflects physical health-related quality of life and comprises of the physical functioning, physical role limitations, general health, and bodily pain health domains. The *Mental Health Component Summary Scale Score (MCS-12)* reflects mental health-related quality of life and consists of the mental health, vitality, social functioning, and emotional role limitations health domains.

Procedures for scoring PCS-12 and MCS-12 summary scales include: (1) Reverse score four of the 12 items such that higher scores for all items indicate better health; (2) Create a dummy indicator for all response choices for each item. However, a dummy indicator is not created for the category that reflects the best health status for each item; (3) PCS-12 and MCS-12 is computed by multiplying each dummy indicator by its respective physical or mental regression weights and summing the products of each item. Physical and mental regression weights were utilized from the general U.S. population and were obtained using the manual by Ware, Kosinski, and Keller (1995); and (4) The PCS-12 and MCS-12 scales are then transformed to norm-based scoring with a mean of 50 and standard deviation of 10.

Norm-based scoring is achieved by adding a constant, produced in the regression, to the sum of the products for each scale described in step 3. Norm-based scoring is advantageous to use because comparisons can be made among the other generic health surveys. PCS-12 and MCS-12 scores are set to missing (n=91) if respondents are missing on any of the items used to create the summary scales. It should be noted that response categories differ slightly for six items in the NLSY97 and those described in the manual by Ware and colleagues (1995). Both physical role limitations and emotional role limitations are measured with two items each with the response choices of yes or no. In the NLSY97, response choices for these respective items include: yes a lot, yes a little, and no not at all. The response choices of “yes a lot” and “yes a little” were collapsed together. The bodily pain health domain is assessed using one item with the response outcome of: no, limited a lot, or limited a little. In the NLSY97, response outcomes for this item include: extremely, quite a bit, moderately, a little bit, or not at all. The response outcomes of “extremely,” “quite a bit,” and “moderately” were collapsed together. In the NLSY97, the social functioning health domain is assessed using one item and it includes one additional response choice compared to the item found in the manual by Ware et al. (1995). The response choice of “a good bit of the time” was combined with the response choice of “most of the time.” The modifications to the response choices of these six items were necessary to be consistent with the items found in the manual by Ware et al. (1995).

Body Weight. We create a lagged measure of body weight that is captured in the survey prior to the collection of HRQoL at age 29. Self-reported height and weight are collected at each wave of the survey. Body mass index (BMI) is calculated for adults as weight in kilograms divided by height in meters squared. Classifications of weight were constructed as follows: underweight (BMI <18.5), healthy weight (BMI 18.5 to 24.9), overweight (BMI 25 to 29.9), Class I obesity (BMI 30 to 34.9), and Class II or higher (BMI of 35 or higher). We also capture BMI for each respondent at age 17 to assess adolescent weight status.

Covariates. Following prior research, we include a set of sociodemographic characteristics as follows: educational attainment by age 25 (less than high school, high school (referent category), some college, and college degree); racial and ethnic composition as Hispanic (any race), Non-Hispanic White (referent category), non-Hispanic black, non-Hispanic other; household poverty to income ratio, and marital status of the respondent. We include health behaviors such as current smoking and binge alcohol consumption. Current smoking is defined as having smoked cigarettes in the past 30 days, while drinking 5 drinks (males) or 4 drinks (females) at one time during the last 30 days is considered binge alcohol consumption.

We also include an indicator of a chronic health condition. Beginning in round 6 (2002), respondents are asked if s/he has ever been diagnosed with any chronic health condition or life threatening disease, such as asthma, diabetes, HIV/AIDS, or cancer. In rounds 11, 12, and 13 (2007, 2008, and 2009), respondents are asked if s/he has been diagnosed with other any chronic health conditions (if s/he reported chronic health conditions in round 6), or if s/he has ever been diagnosed with any chronic health condition or life threatening disease. We include a dichotomous measure of having experienced any chronic health condition.

We also include an exploratory measure of repeated bullying. Once the NLSY97 respondents turn 18, they are asked about whether they were a victim of repeated bullying prior to age 12, and between the ages of 12 to 17. Prior research on adolescents has consistently found that bullying is negatively associated with mental well-being (i.e., Wilkins-Shumer, O'Callaghan, and Najman et al 2001; Rigby, Cox and Black 1997), while the association between bullying and adolescent physical HRQoL is mixed (i.e., Wilkins-Shumer et al 2001; Frisen and Bjarnelind 2009).

ANALYTIC PLAN

All analyses are weighted by custom population weights supplied by the NLSY. Multivariate linear regressions, using PCS-12 and MCS-12 separately as outcome variables are conducted separately for men and women. The following models were run: Model 1 included BMI as a continuous variable; Model 2 added demographic characteristics of race/ethnicity, marital status, and educational attainment; Model 3 added health behaviors (smoking and binge drinking) along with the existence of a chronic health problem; Model 4 included a dichotomous indicator of a history of repeated bullying, and Model 5 adds an indicator of overweight/obesity at age 17.

PRELIMINARY RESULTS

We present descriptive statistics of the analytic sample for men and women in our sample (Table 1). After excluding those who were underweight (N=83), the study sample consisted of 5,851 adults aged 29. There are 3,050 male respondents, and 2,801 female respondents. Seventy-one (71%) of men and 62% of women were overweight or obese. The physical and summary scores for health related quality of life were higher for men than for women, 54.58 and 52.59 compared to 53.68 and 50.83. The prevalence of a chronic condition (i.e., asthma, diabetes, list them here) was higher for women (27%) compared to men (16%), yet men displayed a higher prevalence of health risk behaviors as adults and higher levels of overweight and obesity as adolescents. Tables 2 and 3 display the coefficients for the regression models assessing the relationship between BMI and either PCS-12 or MCS-12.

Lagged BMI has a consistently negative relationship to physical health related quality of life among young adult men and women. There is a consistent gradient with respect to education (Model 2). Those with a bachelor degree or higher report higher levels of PCS-12. Tobacco use and reporting a chronic health condition lowers the overall level of physical well-being, and yet for both men and women excessive alcohol consumption is associated with higher reported physical well-being. A history of repeated bullying has an independent effect on reports of physical well-being among both young men and young women (Model 4). The final model includes an indicator of weight status at age 17 (overweight or obese versus not), finding that among men there is a marginal association to physical HRQoL.

Table 3 presents parallel analyses for the mental health component score (MCS-12). Across all models for men and women, we find no association between BMI and mental health related quality of life. There is no evidence of a gradient with respect to educational attainment for men, but limited evidence for women. The most salient predictors of MCS-12 for both men and women are tobacco consumption and a repeated bullying prior to age 18. Among women, the presence of a chronic condition is related to lower mental well-being but the relationship is not significant for men. However, weight status at age 17 is associated with a reduction in mental well-being among young adult men but not young adult women. The initial findings suggest the importance of weight for young adult's physical quality of life. In addition, the initial findings confirm prior research using the Add Health which found that among adolescents, BMI was not related to various measures of mental health related quality of life (Swallen, Reither, and Hass 2005).

Additional analyses will focus on untangling the relationship between prior weight during adolescence, current weight and our subjective assessments of mental and physical health related quality of life. Given the strength of the relationship between prior bullying and HRQoL for both men and women, we plan on conducting propensity score analysis to better assess the combined role of adolescent weight and bullying victimization on later young adult health related quality of life.

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Table 1: Descriptive characteristics (means and standard errors) of the sample by gender.

	MALE		FEMALE	
	Mean	Standard Error	Mean	Standard Error
Body Mass Index Category*				
Underweight	0.01	0.00	0.02	0.00
Healthy Weight	0.28	0.01	0.35	0.01
Overweight	0.42	0.01	0.36	0.01
Obese Class I	0.18	0.01	0.13	0.01
Obese Class II/III	0.10	0.01	0.14	0.01
Health Related Quality of Life at 29				
Physical Summary Score	54.58	0.09	53.68	0.13
Mental Summary Score	52.59	0.12	50.83	0.15
Educational Attainment by 29				
Less than High School	0.09	0.01	0.08	0.01
High School	0.65	0.01	0.59	0.01
4 Year Degree	0.20	0.01	0.26	0.01
Post 4 Year Degree	0.05	0.00	0.08	0.01
Marital Status at 29				
Never Married	0.57	0.01	0.49	0.01
Married	0.36	0.01	0.41	0.01
Divorced/Separated/Widowed	0.07	0.01	0.11	0.01
Race/Ethnicity				
NH White	0.65	0.01	0.65	0.01
NH Black	0.16	0.01	0.17	0.01
NH Other	0.04	0.00	0.05	0.00
Hispanic (any race)	0.14	0.01	0.13	0.01
Household Income to Poverty Ratio at 29*				
0 to 99%	0.12	0.01	0.13	0.01
100 to 199%	0.14	0.01	0.16	0.01
200 to 299%	0.32	0.01	0.31	0.01
300 to 399%	0.12	0.01	0.11	0.01
>=400%	0.29	0.01	0.29	0.01
Chronic Health Problem (e.g. diabetes, asthma)	0.16	0.01	0.27	0.01
Health Behaviors				
Current Smoker (last 30 days)	0.43	0.01	0.37	0.01
Binge Alcohol Consumption	0.20	0.01	0.14	0.01
Adolescent Characteristics				
Body Weight Classifications				
Underweight	0.01	0.00	0.02	0.00
Healthy Weight	0.77	0.01	0.82	0.01
Overweight	0.13	0.01	0.10	0.01
Obese	0.10	0.01	0.06	0.00
Experience with Repeated Bullying				
No experience	0.71	0.01	0.75	0.01
Repeated bullying before age 18	0.29	0.01	0.25	0.01

National Longitudinal Survey of Youth 1997.

*Measures obtained the year prior to the "Health at 29" questions.

Table 2: Multivariate Linear Regression of the Physical Component Score for Men and Women at age 29, NLSY97

	Model 1	Model 2	Model 3	Model 4	Model 5
MEN					
BMI_lagged	-0.11 ***	-0.10 ***	-0.05 **	-0.10 ***	-0.12 ***
NH Black		0.69 **	0.24	0.66 **	0.65 **
Hispanic		0.45 #	0.26	0.25	0.25
NH Other Race		0.15	0.12	0.17	0.17
Married (ref cat= not married)		0.48 **	0.37	0.37 *	0.38 *
Less than High School (ref cat= High School)		-0.80 #	-2.39 ***	-0.67	-0.67
Bachelor's Degree		1.52 ***	1.44 ***	1.36 ***	1.37 ***
Advanced/Professional Degree		1.89 ***	1.77 ***	1.71 ***	1.72 ***
Current Smoker			-0.77 *	-0.92 ***	-0.91 ***
Binge Alcohol			1.05 **	0.71 **	0.70 **
Chronic Health Problems.			-2.87 ***	-1.05 **	-1.04 **
Repeated bullying prior to age 18				-0.42 *	-0.41 #
Overweight or Obese at 17					0.38 #
Intercept	57.7 ***	54.56 ***	55.49 ***	57.42 ***	57.68 ***
WOMEN					
BMI_lagged	-0.08 **	-0.06 **	-0.05 **	-0.05 **	-0.05 *
NH Black		0.48	0.24	0.24	0.24
Hispanic		0.53	0.26	0.16	0.16
NH Other Race		0.21	0.12	0.16	0.16
Married (ref cat= not married)		0.54 *	0.37	0.30	0.30
Less than High School (ref cat= High School)		-2.68 ***	-2.39 ***	-2.41 ***	-2.41 ***
Bachelor's Degree		1.73 ***	1.44 ***	1.32 ***	1.32 ***
Advanced/Professional Degree		1.97 ***	1.77 ***	1.66 ***	1.66 ***
Current Smoker			-0.77 *	-0.67 *	-0.67 *
Binge Alcohol			1.05 **	1.05 **	1.05 **
Chronic Health Problems.			-2.87 ***	-2.75 ***	-2.75 ***
Repeated bullying prior to age 18				-1.57 ***	-1.57 ***
Overweight or Obese at 17					0.05
Intercept	55.89 ***	54.56 ***	55.49 ***	55.80 ***	55.81 ***

Table 2: Multivariate Linear Regression of the Mental Component Score for Men and Women at age 29, NLSY97

	Model 1	Model 2	Model 3	Model 4	Model 5
MEN					
BMI_lagged	0.01	0.01	0.00	0.01	0.03
NH Black		0.75 *	0.64 *	0.54 #	0.55 #
Hispanic		0.98 **	0.81 **	0.72 *	0.72 *
NH Other Race		1.36 **	1.36 **	1.29 *	1.29 *
Married (ref cat= not married)		1.00 ***	0.84 ***	0.75 **	0.74 **
Less than High School		-0.58	-0.33	-0.36	-0.36
Bachelor's Degree		0.37	0.14	0.08	0.06
Advanced/Professional Degree		0.05	-0.22	-0.33	-0.35
Current Smoker			-1.27 ***	-1.21 ***	-1.22 ***
Binge Alcohol			0.08	0.01	0.03
Chronic Health Problems.			-0.44	-0.30	-0.31
Repeated bullying prior to age 18				-1.34 ***	-1.36 ***
Overweight or Obese at 17					-0.74 *
Intercept	52.19 ***	51.75 ***	52.61 ***	52.86 ***	52.34 ***
	Model 1	Model 2	Model 3	Model 4	Model 5
WOMEN					
BMI_lagged	-0.04	-0.03	-0.03	-0.02	-0.02
NH Black		1.04 **	0.52	0.52	0.53
Hispanic		0.77 *	0.40	0.29	0.29
NH Other Race		0.29	0.11	0.16	0.18
Married (ref cat= not married)		1.80 ***	1.41 ***	1.34 ***	1.32 ***
Less than High School		-1.60 *	-1.32 *	-1.35 *	-1.34 *
Bachelor's Degree		0.37	-0.06	-0.19	-0.20
Advanced/Professional Degree		1.28 **	0.83 #	0.72	0.71
Current Smoker			-1.75 ***	-1.65 ***	-1.64 ***
Binge Alcohol			-0.35	-0.36	-0.37
Chronic Health Problems.			-1.31 ***	-1.18 **	-1.17 **
Repeated bullying prior to age 18				-1.71 ***	-1.70 ***
Overweight or Obese at 17					-0.29
Intercept	51.94 ***	50.68 ***	51.97 ***	52.31 ***	52.23 ***