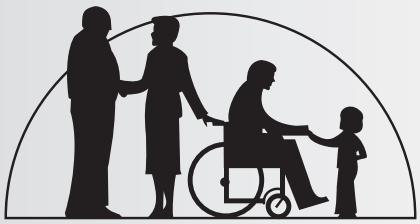
This document is made available electronically by the Minnesota Legislative Reference Library as part of an ongoing digital archiving project. http://www.leg.state.mn.us/lrl/lrl.asp

DHS-4989-ENG 9-07

Association between body weight and behavioral health among adults in Minnesota

August 2007



Minnesota Department of **Human Services**
Performance Measurement and Quality Improvement Division

Association between body weight and behavioral health among adults in Minnesota

By
Eunkyung Park, Ph.D.

Performance Measurement and Quality Improvement Division

August 2007

Copies of this report can be printed from http://www.dhs.state.mn.us/healthcare/studies .

This information is available in other forms to people with disabilities by contacting us at (651) 431-2616 (voice). TTY/TDD users can call the Minnesota Relay at 711 or (800) 627-3529. For the Speech-to-Speech Relay, call (877) 627-3848.

A statewide survey conducted in 2004-2005 shows that about 38% of Minnesota adults are overweight and an additional 22% are obese.[1] Obesity is among the easiest to recognize and the most difficult to treat of medical conditions.[2] Treatment of weight problems should address not only obesity per se, but also other related medical conditions, both physical and mental. It is well known that being overweight or obese increases the risk of many physical health conditions, such as hypertension, type 2 diabetes, coronary heart disease and some cancers. Some researchers believe that the same neurochemical imbalances leading to obesity can also cause psychiatric symptoms, and both obesity and substance abuse can be considered as appetitive compulsions.[3] However, research on the association between obesity and psychological well-being has shown inconsistent findings.

This report examines the relationship between body weight status and behavioral health issues, such as substance abuse, smoking and mental health problems among adults in Minnesota. Data came from the Minnesota Survey on Adult Substance Use (MNSASU), a statewide telephone survey conducted between October 2004 and July 2005. A total of 16,891 adults, selected using a stratified random sample design, participated in the survey with an overall response rate of 55%.[4] Adults under the age of 20[5] (418 cases) and pregnant women (184 cases) are excluded from the analyses.

Body mass index (BMI), an index of weight adjusted for the height of an individual (kg/m^2), was computed using self-reported height and weight information. Based on the BMI score, each respondent was assigned into one of the four weight status categories: underweight (below 18.5), healthy weight (18.5-24.9), overweight (25.0-29.9) and obese (30.0 and above).[6,7] Both categorical body weight status and numerical BMI are used in the analyses.

Substance use disorder was measured for alcohol and illicit drugs using DSM-IV criteria[8] for abuse and dependence. If a person was found to be either an abusive or dependent user of alcohol s/he was defined to have an alcohol use disorder. The same definition

---

[1] Park E. Prevalence of overweight and obesity among adults in Minnesota and the relationships with demographic variables. Available on DHS Web siteweb page at www.dhs.state.mn.us/healthcare/pmqi .

[2] Devlin M, Yanovski S, & Wilson G. Obesity: What mental health professionals need to know. *Am J Psychiatry*2000; 157(6): 854-866.

[3] Comings DE, Gade R, MacMurray JP, Muhleman D, Peters WR. Genetic variants of the human obesity (OB) gene: association with body mass index in young women, psychiatric symptoms, and interaction with the dopamine D2 receptor (DRD2) gene. Mol Psychiatry 1996; 1: 325–335.

[4] For detailed information about the survey, go to DHS Web siteweb page: http://www.dhs.state.mn.us/main/groups/healthcare/documents/pub/dhs_id_010105.hcsp#P165_4772

[5] According to U.S. Department of Health and Human Services, those who are 12 to 19 years oldyear olds are considered as adolescents in terms of body weight status and there is no generally accepted definition for obesity as distinct from overweight in children and adolescents.

[6] CDC document available at http://www.cdc.gov/nccdphp/dnpa/obesity

[7] U.S. Department of Health and Human Services. *Statistics related to overweight and obesity.* October 2006

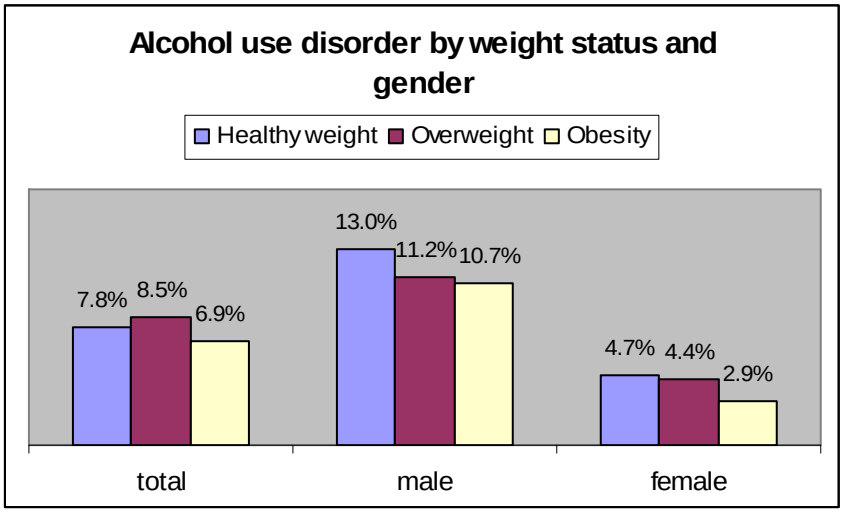
[8] Diagnostic and Statistical Manual of Mental Disorders, 4th edition. 1994. American Psychiatirc Association.

was applied for drug use disorder. In addition to the past year alcohol and drug use disorders, smoking behavior was examined in relation to body weight status.

Two measures of mental health problems were included in the survey: a screener for possible depression and a screener for nonspecific serious psychological distress (SPD).[9] For depression, a two-item Patient Health Questionnaire (PHQ-2) was used asking respondents how often in the past two weeks they had been "bothered by having very little interest or pleasure in doing things" or "bothered by feeling down, depressed or hopeless." For SPD, a six-item K6 scale was used asking how often during the past 30 days the respondent felt "nervous," "worthless," "restless," "hopeless," "depressed," or "that everything was an effort." Being positive on either of these two screeners was used as a proxy measure for psychological well-being with '1' denoting those screened positive in one or both screeners and '0' denoting those screened negative on both screeners.

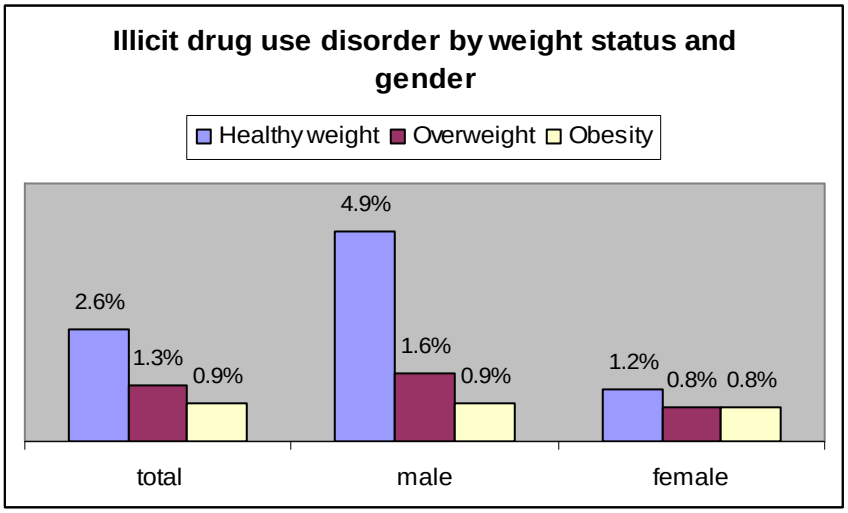
In addition, self assessment of physical and mental health was measured by asking "During the past 12 months, would you say your physical health [emotional or psychological health] has been excellent, very good, good, fair, or poor?"

There is no significant difference in the prevalence of alcohol use disorder across body weight categories. Drug use disorder, however, is more prevalent among male adults with a healthy weight than those who are overweight or obese.



[9] More detailed information about the measurement can be found in "Minnesota adults with co-occurring substance use and mental health disorders" available on DHS web page at http://www.dhs.state.mn.us/main/groups/healthcare/documents/pub/dhs_id_059051.pdf

About 7.9% of Minnesota adults age 20 or older have alcohol abuse or dependence. This varies little across body-weight categories: 7.8% of those with a healthy weight, 8.5% of those who are overweight and 6.9% of those who are obese have alcohol use problems (X^2=7.92 p=.403). Across all weight categories,[10] males are significantly more likely to have alcohol problems than females (odds ratio=2.73, p=.000).[11] However, there is no significant difference in the prevalence of alcohol use disorder across weight categories (X^2=4.97 p=.299 for males; X^2=11.08 p=.108 for females). Multivariate regression analyses controlling for various relevant factors, such as age, gender, race/ethnicity, and other socioeconomic factors also confirm this finding (see appendix).



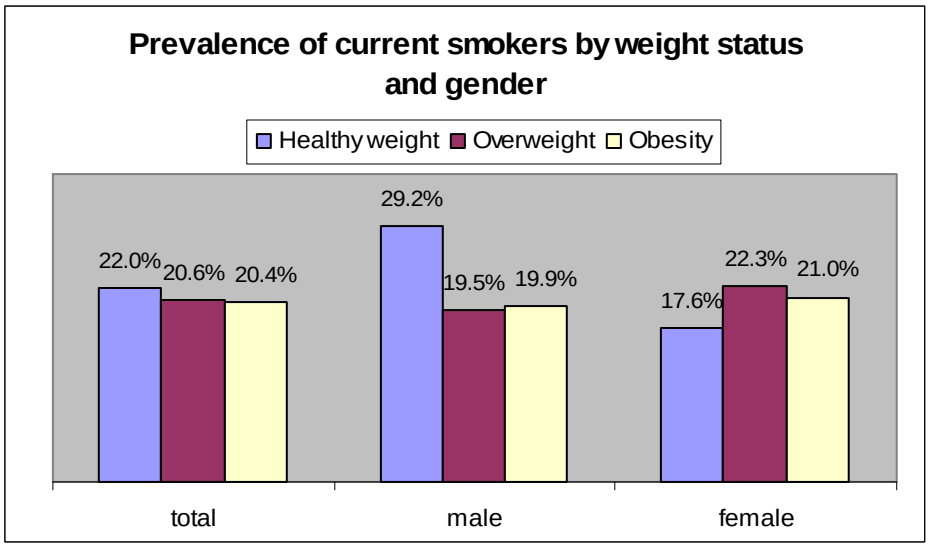
About 1.7% of Minnesota adults age 20 or older have illicit drug abuse or dependence. Overall, males have drug use problems more than females (2.4% compared to 1.1%; X^2=38.67 p=.000). When examined across weight categories,[12] those with a healthy weight are significantly more likely to have drug use problems than those who are overweight or obese (2.6% compared to 1.3% and 0.9% respectively; X^2=45.89 p=.000). However, this relationship is true only among males and not among females (X^2=68.67 p=.000 for male; X^2=2.77 p=.499 for female). Multivariate logistic regression analyses also confirm these findings (see appendix).

[10] For the three-way table analyses with gender, body weight and alcohol use disorder, underweight category was excluded due to the small sub-sample size.
[11] The odds ratio is from a multivariate logistic regression controlling for age, race/ethnicity, marital status, employment, education, income and body weight status.
[12] Due to the overall small prevalence of drug problem, both two-way and three-way table analyses were conducted only with the healthy weight, overweight, and obesity categories.

Among male adults, those with a healthy weight are more likely to smoke than their overweight or obese counterparts.
Among females, however, both overweight and underweight adults are more likely to smoke than their healthy-weight counterparts.

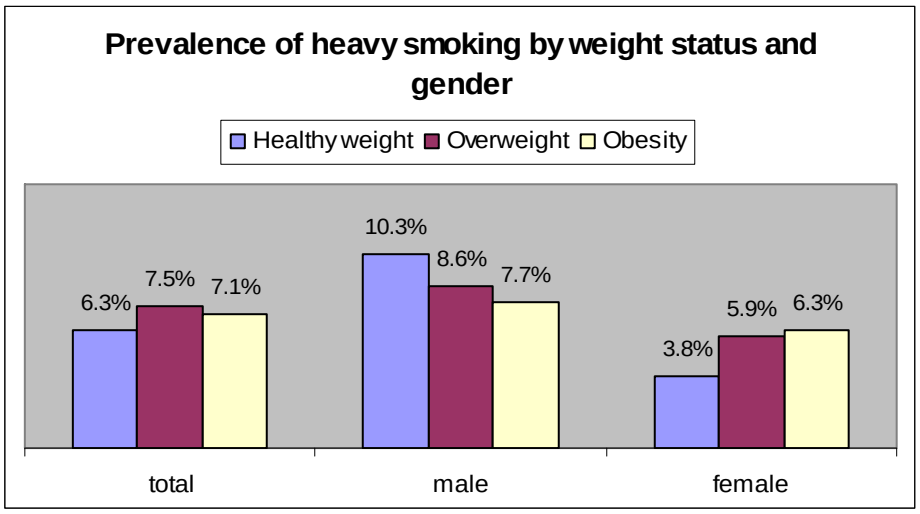
For this report, a current smoker is defined as someone who has smoked 100 cigarettes or more in their lives, currently smokes everyday or some days, and has smoked during past 30 days. Among Minnesota adults age 20 or older, 21% are current smokers. Compared to females, males are more likely to be a current smoker (22% vs. 19%; X^2=13.26 p=.015), and more likely to smoke one pack or more of cigarettes everyday (9% vs. 5%; X^2=94.22 p=.000).

No significant relationship was found between the likelihood of being a current smoker and body weight categories (X^2=14.73 p=.089). However, this overall finding actually masked significant relationships found among males and females separately. Among male adults, those with a healthy weight are more likely to be current smokers than those who are either overweight or obese (X^2=66.33 p=.000).[13] Among females, overweight or obese adults are more likely to be current smokers than those with a healthy weight (X^2=24.66 p=.005). In addition, underweight females are more likely to be a smoker than their healthy weight counterparts: 31% of underweight females, compared to 17% of healthy-weight females, are current smokers. Multivariate logistic analyses confirm these findings: The rate of current smoking is significantly lower among overweight or obese males than among their healthy-weight counterparts (odds ratio=.702 for overweight males; .595 for obese males), whereas it is significantly higher among overweight or underweight females, compared to their healthy-weight counterparts (odds ratio=1.398 for overweight females; 2.021 for underweight females).



[13] For the three-way table analyses with gender, body weight and smoking, underweight category was excluded due to the small sub-sample size.

Similar patterns appear when heavy smoking behavior (smoking one pack or more everyday) is examined across weight status and gender. Among male adults, those with a healthy weight report heavy smoking more than those who are overweight or obese, while among female adults, those who are overweight or obese report heavy smoking more than those who have a healthy weight. In the three-way table analyses, the differences were significant only among female adults (X^2=7.29 p=.267 for all; X^2=7.07 p=.158 for males; X^2=24.07 p=.002 for females). Multivariate logistic analyses show, however, that the body weight status is a significant factor for explaining heavy smoking behavior only among males (Wald F=2.8, p=.038 for males; Wald F=1.95, p=.119 for females).



Finally, those who are not current smokers are further divided into "former smokers" who had smoked 100 cigarettes or more in their lives but said that they now don't smoke and didn't report any smoking during the past 30 days, and "never smokers" who had smoked less than 100 cigarettes in their lives and did not smoke during the past 30 days. The body mass index score is examined across the three sub-groups: current smokers, former smokers and never smokers. Males have higher BMI scores than females among former and never smokers, but not among current smokers. Among males, former smokers have the highest mean score of BMI and current smokers have the lowest, while among females, never smokers have the lowest mean score of BMI.

Mean Score of BMI for Smoking Sub-Groups by Gender

	Male mean (95% CI)	Female mean (95% CI)
Current smoker	26.7 (26.3-27.0)	26.6 (26.2-27.0)
Former smoker	28.1 (27.8-28.4)	27.0 (26.7-27.4)
Never smoker	27.4 (27.1-27.6)	25.9 (25.7-26.1)
Total	27.4 (27.3-27.6)	26.3 (26.1-26.5)

There was significant difference in the age distribution across the three smoking sub-groups with former smokers being the oldest and current smokers the youngest (mean age=39.8 for current smokers, 53.8 for former smokers and 45.8 for never smokers). Since age is also related to body weight,[14] statistical analyses were conducted controlling for age.

Confirming what was found in the previous analyses, male smokers tend to have lower BMI scores compared to never smokers (b=-.643, p=.003) whereas female smokers have higher BMI scores compared to never smokers (b=.929, p=.000).[15] Former smokers have higher BMI scores than never smokers for both genders (b=.632, p=.002 for males; b=.998, p=.000). However, compared to current smokers, former smokers tend to have higher BMI scores among males, but not among females (b=1.275, p=.000 for males; b=.069, p=.816 for females).

Obese adults are more likely to have a negative perception of their physical health than those with a healthy weight. There is no association between self-assessment of mental health and body weight status among males, while females who are overweight or obese are more likely to have a negative perception than their healthy-weight counterparts.

A majority of Minnesota adults age 20 or older view their physical and mental health conditions positively: 55% self-assessed their physical health as being excellent or very good and the same proportion viewed their mental health as being excellent or very good. About 16% of Minnesota adults, on the other hand, viewed their physical health as either fair or poor, and about 15% reported their mental health as either fair or poor.

Minnesota adults who are overweight or obese are significantly less likely to have a positive view of their physical health than those who have a healthy weight (X^2=651.14 p=.000): 64% of those who have a healthy weight, compared to 56% of the overweight adults and 38% of the obese adults, view their physical health as being excellent or very good. On the other hand, more than one in every four obese adults (26%) perceive their physical health as fair or poor during the past 12 months, compared to 12% of healthy-weight adults and 14% of overweight adults.

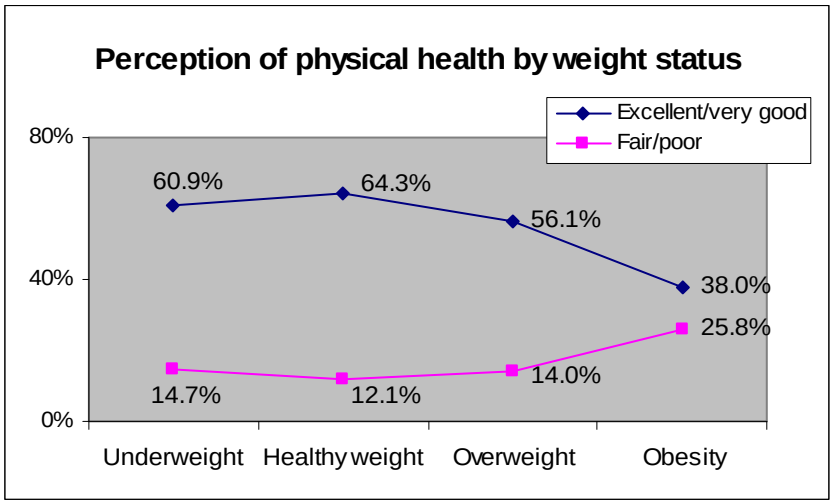
Minnesota adults with obesity are significantly less likely than the others to have a positive view of their mental health (X^2=99.79, p=.000): 49% of obese adults, compared to 58% of those with a healthy weight and 56% of overweight adults, report their mental health as excellent or very good. About 19% of obese adults, compared to 13% of those

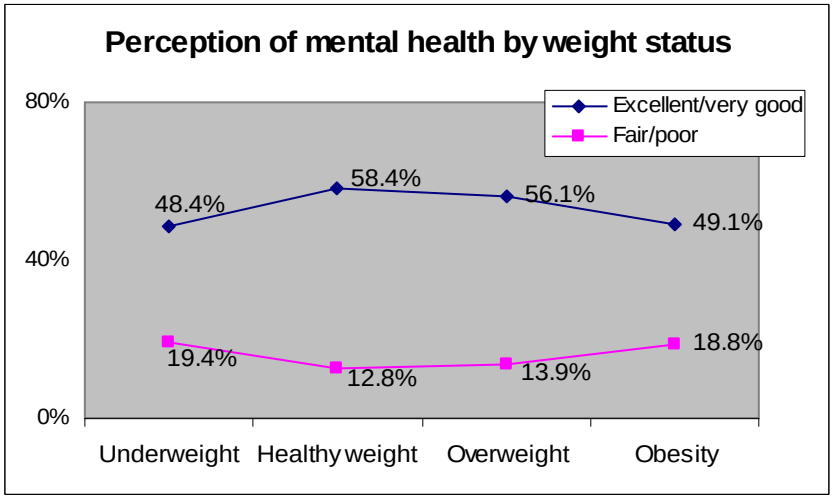
[14] In general, older Minnesota adults are more likely to be overweight or obese than younger adults. For more details, refer to the report "Prevalence of overweight and obesity among adults in Minnesota and the relationships with demographic variables" available on DHS Web site at www.dhs.state.mn.us/healthcare/pmqi

[15] Linear regression analysis was conducted separately for each gender with BMI as the dependent variable and smoking sub-groups as the independent variable and age as a control variable.

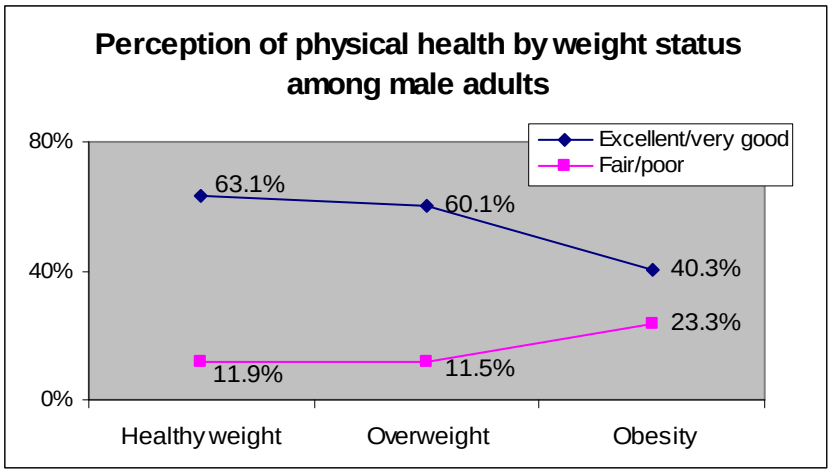
with a healthy weight and 14% of those who are overweight, report that their mental health was fair or poor during the past 12 months.

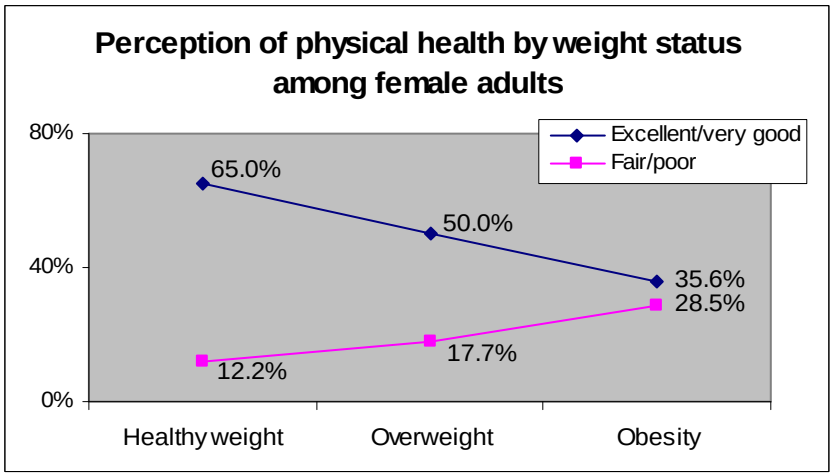
One interesting finding is that underweight adults show a pattern similar to obese adults in their perception of mental health: About 48% of underweight adults and 49% of obese adults report their mental health as excellent or very good, and 19% of each group report their mental health as fair or poor. Due to the small sub-sample size of the underweight adults, the confidence intervals of the estimates for the group tend to be large, but this finding warrants more attention from practitioners and researchers.





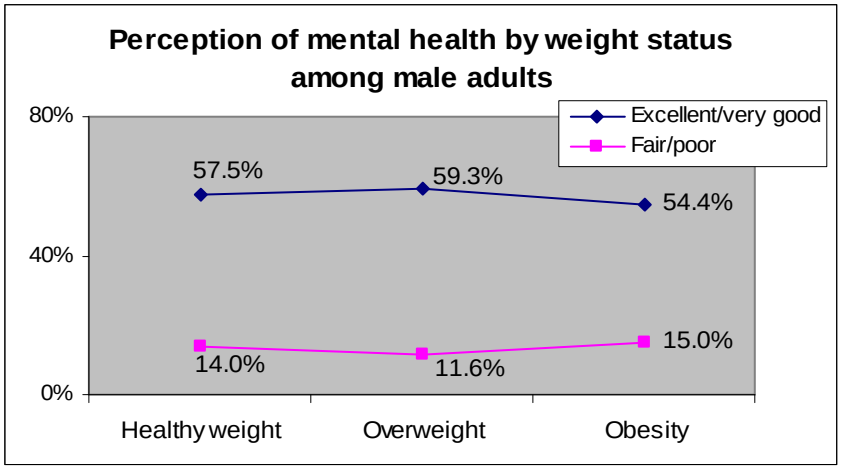
The perception of physical and mental health conditions is examined separately for each gender in the following charts.

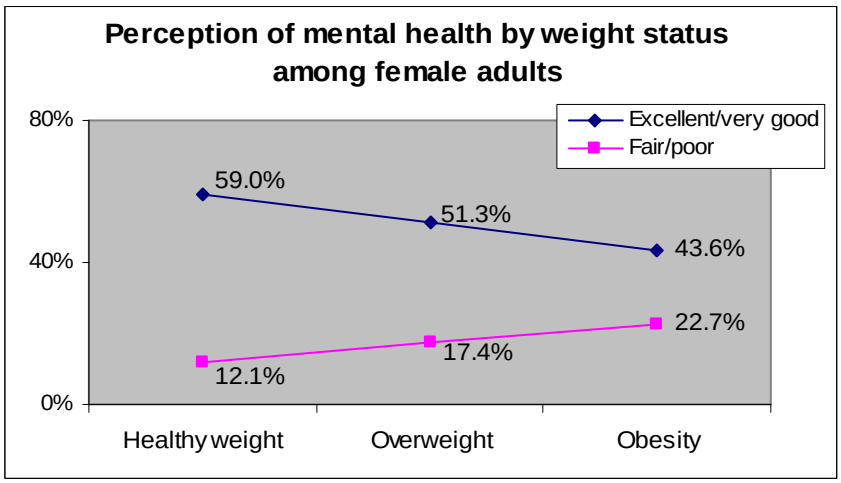




The prevalence of negative perception of their physical health is significantly higher among obese males than their healthy-weight or overweight counterparts: 23% of obese males, compared to 12% of each of the other sub-groups, view their physical health as fair or poor (X^2=224.58, p=.000). Among females, the negative perception of their physical health significantly increases as their bodyweight status changes from healthy weight through overweight to obesity: 12% of healthy-weight females, 18% of overweight females and 29% of obese females view their physical health as fair or poor (X^2=509.17 p=.000). In addition, 13% of underweight females view their physical health as fair or poor (not shown in chart).

Self-assessment of mental health among male adults is not related to their body weight status (X^2=15.54 p=.085). Female adults' self-assessment of their mental health, on the other hand, changes across their body weight status in a pattern similar to their physical health perception. For example, the prevalence of negative perception significantly increases as body-mass index increases: 12% of the healthy-weight females, 17% of overweight females and 23% of obese females view their mental health as being fair or poor (X^2=164.41 p=.000).



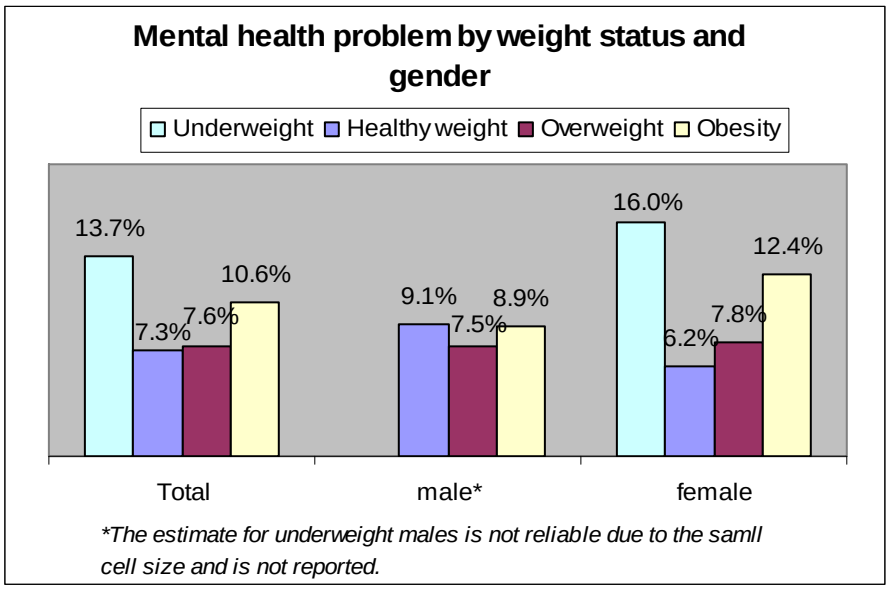


Although not shown in the charts, the self-assessment of their health among the underweight females deserves some attention. While their perception of physical health is in general closer to that of their healthy-weight counterparts (13% of underweight females view their physical health as fair or poor), the perception of their mental health is closer to that of the overweight/obese females (20% of underweight females view their mental health as fair or poor).[16]

Among female adults, those who are obese or underweight are more likely to have mental health problems than their healthy-weight counterparts.
Among males, however, there is no association between body weight status and the likelihood of having a mental health problem.

[16] The underweight male sub-group was too small to provide reliable estimates.

About 8% of Minnesota adults age 20 or older have a mental health problem (either a depression or SPD). There is no significant gender difference in the prevalence of mental health problems (8.3% for males and 8.2% for females; X^2=.029 p=.903)[17]. Overall, those who are obese or underweight are more likely to have mental health problems (X^2=41.95 p=.000). When examined separately for each gender, however, there was a significant relationship between mental health problem and body weight among females but not among males (X^2=4.23 p=.316 for males; X^2=67.35 p=.000 for females). Female adults who are obese (12%) or underweight (16%) are significantly more likely to have mental health problems than those with a healthy weight (6%). Multivariate analyses confirm these findings (see Appendix). This is also consistent with the patterns found on the self-assessment of mental health.



Although there was no significant difference in the prevalence of mental health problems between genders overall, three-way table analyses show an interesting interaction between gender and body weight in relation to the likelihood of having a mental health problem. Among obese adults, females are significantly more likely to have a mental health problem than their male counterparts, whereas among healthy-weight adults, males are significantly more likely to have a mental health problem than their female counterparts. About 12.4% of females who are obese, compared to 8.9% of their male counterparts, have mental health problems (odds ratio=1.46; 95% CI=1.08-1.98), while about 6.2% of healthy-weight females, compared to 9.1% of their male counterparts, have mental health problems (odds ratio=.66; 95% CI=.49-.89).

In sum, body weight status shows some interesting association with various behavioral health problems, and gender seems to function as a moderating factor in some of them.

[17] Statistical tests for depression and SPD separately also show no difference. However, t-test comparing the mean scores on each screener shows significantly higher mean score for females than males. Further analyses show that the difference exists only among those who are screened negative on the screener.

Overweight and/or obese female adults are more likely to be a current smoker, more likely to view their physical and mental health conditions negatively, and more likely to have a mental health problem. Among male adults, on the other hand, such an association does not exist (as in the case of self-assessment of mental health condition and the likelihood of having a mental health problem), or changes the direction (as in the case of smoking where males with a healthy weight are more likely to smoke than their counterparts). In addition, underweight females are more likely to be a current smoker, more likely to view their mental health conditions negatively, and more likely to have a mental health problem than their healthy-weight counterparts.

-- Appendix –

Description of major variables

Variable	Unweighted n	Weighted % (SE)
Gender		
Male	6,630	49.1 (0.6)
Female	9,659	50.9 (0.6)
Age		
20-29	2,176	18.5 (0.5)
30-39	3,024	19.7 (0.4)
40-49	3,695	22.8 (0.5)
50-59	3,234	16.8 (0.4)
60-69	1,974	10.0 (0.3)
70 or older	2,186	12.2 (0.3)
Race/Ethnicity		
White	13,731	90.8 (0.4)
Black	526	3.1 (0.2)
American Indian	292	0.8 (0.1)
Hispanic	860	2.5 (0.2)
Asian/Pacific Islander	453	2.7 (0.3)
Education		
High school graduate or less	5,187	30.4 (0.5)
Some college or associate degree	5,376	34.9 (0.5)
4-yr college graduate or above	5,690	34.7 (0.5)
Income		
30,000 or less	4,922	23.2 (0.4)
30,001 through 60,000	5,462	32.9 (0.5)
More than 60,000	5,905	44.0 (0.6)
Marital status		
Never married	2,600	15.2 (0.5)
Married/cohabitating	10,144	71.0 (0.5)
Widowed/divorced/separated	3,516	13.7 (0.3)
Employment status		
Full/part-time work	11,321	73.0 (0.5)
Unemployed	464	2.7 (0.2)
Not in labor force	4,496	24.3 (0.5)
Weight Status		
Underweight	226	1.4 (0.1)
Healthy weight	5,843	38.6 (0.6)
Overweight	5,559	38.3 (0.6)
Obese	3,420	21.7 (0.5)
Self-assessed physical health		
Excellent/very good	8,529	55.3 (0.6)
Good	4,717	28.5 (0.5)
Fair/poor	3,031	16.1 (0.4)

Description of major variables (continued)

Variable	Unweighted n	Weighted % (SE)
Self-assessed mental health		
Excellent/very good	8,572	55.2 (0.6)
Good	4,941	30.0 (0.5)
Fair/poor	2,759	14.8 (0.4)
Psychological well-being (screened positive for depression or serious psychological distress)	1,529	8.2 (0.3)
Alcohol use disorder (screened positive for abuse or dependence)	1,091	7.9 (0.3)
Drug use disorder (screened positive for abuse or dependence)	243	1.7 (0.2)
Continuous variable		Mean (SE)
Age		46.5 (0.2)
BMI		26.9 (0.1)

Multivariate logistic regression results for alcohol use disorder

	Males (n=5993)		Females (n=8625)	
Factors (reference category)	Odds Ratio	95% CI	Odds Ratio	95% CI
Age (20-29)	p=.000		p=.000	
30-39	.59	.41-.85	.41	.26-.63
40-49	.50	.35-.71	.39	.25-.59
50-59	.41	.28-.60	.25	.14-.45
60-69	.23	.13-.41	.08	.03-.20
70 or older	.08	.04-.21	.01	.00-.03
Race/ethnicity (white)	p=.048		p=.000	
Black	.40	.12-1.34	.46	.20-1.07
American Indian	1.06	.43-2.57	.31	.07-1.27
Hispanic	.49	.22-1.07	.17	.06-.53
Asian/Pacific Islander	.21	.05-..88	.03	.00-.21
Education (4-year college degree or above)	p=.067		p=.022	
High school graduate or less	1.43	1.04-1.98	1.86	1.19-2.89
Some college	1.09	.81-1.47	1.37	.93-2.04
Income (30,000 or less)	p=.086		p=.419	
30,001-60,000	1.15	.80-1.63	.94	.53-1.65
more than 60,000	1.49	1.01-2.20	1.22	.68-2.17
Marital status (married/cohabitating)	p=.000		p=.000	
Never married	1.76	1.27-2.44	2.35	1.52-3.62
Widowed/divorced/separated	1.77	1.26-2.49	1.85	1.11-3.06
Employment status (unemployed)	p=.478		p=.078	
Full/part-time work	.82	.47-1.45	.61	.28-1.33
Not in labor force	.65	.31-1.33	.40	.17-.94
Weight status (healthy weight)	p=.731		p=.131	
Underweight	.51	.13-2.01	1.90	.62-5.86
Overweight	1.06	.80-1.42	1.11	.74-1.65
Obese	.99	.71-1.37	.67	.41-1.09
Dependent variable: Alcohol use disorder	1=have an alcohol use disorder (abuse or dependence) 0=do not have an alcohol use disorder			

Multivariate logistic regression results for drug use disorder

	Males (n=5962)		Females (n=8439)	
Factors (reference category)	Odds Ratio	95% CI	Odds Ratio	95% CI
Age[a]	p=.000		p=.000	
	.41	.33-.52	.47	.36-.62
Race/ethnicity (white)	p=.000		p=.012	
Black	.40	.10-1.67	.67	.26-1.73
American Indian	5.62	1.43-22.14	3.43	1.22-9.69
Hispanic	.21	.03-1.24	.59	.08-4.27
Asian/Pacific Islander	.03	.00-..22	.10	.01-1.02
Education (4-year college degree or above)	p=.004		p=.016	
High school graduate or less	2.98	1.56-5.68	3.93	1.54-9.99
Some college	2.04	1.08-3.88	3.13	1.13-8.71
Income (30,000 or less)	p=.745		p=.047	
30,001-60,000	.84	.45-1.57	.46	.20-1.08
more than 60,000	.79	.43-1.47	.29	.09-.92
Marital status (married/cohabitating)	p=.000		p=.386	
Never married	1.96	1.01-3.81	1.98	.75-5.21
Widowed/divorced/separated	5.42	2.72-10.80	1.33	.46-3.83
Employment status (unemployed)	p=.000		p=.170	
Full/part-time work	.18	.08-.39	.51	.16-1.67
Not in labor force	.57	.21-1.50	.27	.07-1.12
Weight status (healthy weight)	p=.000		p=.505	
Overweight	.54	.31-.93	.69	.31-1.55
Obese	.24	.11-.50	.64	.28-1.47
Dependent variable: Drug use disorder	1=have a drug use disorder (abuse or dependence) 0=do not have a drug use disorder			

[a] Age was entered as a numerical variable and the odds ratio was computed for every 10 year age difference.

Multivariate logistic regression results for current smoking

	Males (n=5832)		Females (n=8453)	
Factors (reference category)	Odds Ratio	95% CI	Odds Ratio	95% CI
Age (20-29)	p=.000		p=.000	
30-39	.64	.46-.89	.61	.47-.79
40-49	.71	.52-.96	.54	.42-.71
50-59	.52	.38-.73	.37	.28-.50
60-69	.21	.14-.32	.19	.14-.27
70 or older	.07	.04-.13	.04	.02-.06
Race/ethnicity (white)	p=.029		p=.000	
Black	.78	.45-1.34	.67	.45-1.01
American Indian	2.35	1.05-5.27	6.00	2.84-12.69
Hispanic	.50	.28-.90	.20	.10-.43
Asian/Pacific Islander	.80	.33-.1.96	.52	.19-1.41
Education (4-year college degree or above)	p=.000		p=.000	
High school graduate or less	4.31	3.29-5.63	4.71	3.63-6.12
Some college	2.52	1.96-3.24	2.87	2.25-3.66
Income (30,000 or less)	p=.323		p=.071	
30,001-60,000	.89	.69-1.15	.91	.72-1.14
more than 60,000	.81	.61-1.07	.73	.55-.97
Marital status (married/cohabitating)	p=.000		p=.000	
Never married	4.31	3.29-5.63	1.23	.93-1.62
Widowed/divorced/separated	2.52	1.96-3.24	1.92	1.54-2.40
Employment status (unemployed)	p=.456		p=.032	
Full/part-time work	.89	.69-1.15	.53	.33-.86
Not in labor force	.81	.61-1.07	.53	.33-.87
Weight status (healthy weight)	p=.001		p=.001	
Underweight	1.21	.33-4.46	2.02	1.22-3.36
Overweight	.70	.56-.88	1.40	1.13-1.73
Obese	.60	.46-.78	1.03	.82-1.29
Dependent variable: Current smoker	1=yes 0=no			

Multivariate logistic regression results for heavy smoking

	Males (n=5977)		Females (n=8604)	
Factors (reference category)	Odds Ratio	95% CI	Odds Ratio	95% CI
Age (20-29)	p=.000		p=.000	
30-39	.96	.55-1.67	1.47	.87-2.49
40-49	1.22	.72-2.04	1.47	.89-2.41
50-59	1.40	.82-2.41	1.28	.74-2.22
60-69	.40	.21-.76	.72	.39-1.33
70 or older	.10	.04-.25	.09	.04-.21
Race/ethnicity (white)	p=.000		p=.000	
Black	.20	.07-.56	.27	.12-.60
American Indian	1.21	.47-3.12	.51	.24-1.08
Hispanic	.07	.02-.21	.08	.02-.35
Asian/Pacific Islander	.02	.00-.07	.05	.01-.38
Education (4 year college degree or above)	p=.000		p=.000	
High school graduate or less	6.91	4.31-11.07	5.05	3.17-8.02
Some college	3.55	2.23-5.65	3.43	2.19-5.36
Income (30,000 or less)	p=.729		p=.156	
30,001-60,000	1.15	.80-1.65	1.05	.73-1.50
more than 60,000	1.06	.72-1.56	.75	.50-1.12
Marital status (married/cohabitating)	p=.000		p=.000	
Never married	1.65	1.10-2.48	1.36	.81-2.27
Widowed/divorced/separated	2.32	1.52-3.52	2.39	1.69-3.38
Employment status (unemployed)	p=.027		p=.001	
Full/part-time work	.82	.46-1.47	.30	.16-.58
Not in labor force	1.42	.72-2.79	.41	.20-.83
Weight status (healthy weight)	p=.038		p=.119	
Underweight	2.85	.49-16.62	1.80	.87-3.72
Overweight	.90	.64-1.26	1.43	1.02-2.01
Obese	.64	.44-.92	1.28	.89-1.83
Dependent variable: Heavy smoker	1=yes (smoke 1 pack or more of cigarettes everyday) 0=no			

Multivariate logistic regression results for mental health problem

	Males (n=5901)		Females (n=8528)	
Factors (reference category)	Odds Ratio	95% CI	Odds Ratio	95% CI
Age (20-29)	p=.006		p=.000	
30-39	1.44	.89-2.32	1.06	.69-1.63
40-49	1.41	.90-2.20	1.54	1.03-2.29
50-59	1.82	1.13-2.94	1.43	.95-2.15
60-69	.84	.46-1.52	.86	.54-1.37
70 or older	.75	.39-1.42	.53	.32-.86
Race/ethnicity (white)	p=.001		p=.015	
Black	2.67	1.49-4.78	1.93	1.19-3.11
American Indian	.78	.45-1.72	1.43	.59-3.50
Hispanic	1.81	1.03-3.16	1.95	1.09-3.51
Asian/Pacific Islander	.54	.18-1.57	.79	.27-2.36
Education (4 year college degree or above)	p=.000		p=.000	
High school graduate or less	2.32	1.63-3.29	1.97	1.43-2.72
Some college	2.01	1.39-2.90	1.20	.89-1.64
Income (30,000 or less)	p=.000		p=.000	
30,001-60,000	.50	.36-.71	.53	.40-.70
more than 60,000	.43	.29-.65	.59	.42-.85
Marital status (married/cohabitating)	p=.013		p=.000	
Never married	1.35	.92-1.99	1.59	1.07-2.35
Widowed/divorced/separated	1.64	1.16-2.32	1.78	1.35-2.35
Employment status (unemployed)	p=.000		p=.000	
Full/part-time work	.44	.22-.86	.28	.17-.48
Not in labor force	.93	.44-1.96	.50	.29-.85
Weight status (healthy weight)	p=.533		p=.001	
Underweight	.41	.12-1.38	2.61	1.26-5.43
Overweight	.93	.68-1.27	1.17	.89-1.52
Obese	.91	.65-1.27	1.64	1.25-2.16
Dependent variable: Psychological well-being	1=positive on depression screener (PHQ-2) or serious psychological distress screener (K6) 0=negative on both screeners			