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Does the association between depression and smoking vary by body mass index (BMI) category?

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ABSTRACT

Objective. The purpose of this study was to explore how weight might influence the relationship between depression and smoking.

Methods. Data were obtained from a cross-sectional survey representative of women age 40–65 enrolled in Group Health Cooperative, a health plan serving members in Washington and northern Idaho ($n = 4640$). We examined the relationships between depression and smoking in normal weight, overweight, and obese women using weighted multiple logistic regression with both minimal and full adjustment.

Results. Current depression was significantly associated with current smoking in obese women (adjusted odds ratio = 2.48, 95% confidence interval = 1.26–4.88) but not in underweight/normal or overweight women. Among ever smokers, obese women, but not other groups, were significantly less likely to have quit smoking in the past.

Conclusions. In our preliminary study, the association between smoking and depression in middle-aged women appears to be limited to the obese subset and may stem from a lesser likelihood of obese ever smokers to have quit. This population represents an important target for preventive medicine efforts.

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Introduction

There is a strong relationship between depression and tobacco use initiation (Rohde et al. 2003), progression to heavy smoking (Breslau et al., 2004; Rohde et al., 2004a) and nicotine dependence (Breslau et al., 1991, 1993, 2004; Rohde et al., 2004a), though the dependency criteria may be driving this last association (Breslau and Johnson, 2000) with the Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition criteria more weakly predicting cessation compared to Fagerstrom Test for Nicotine Dependence. The relationship between depression and tobacco use cessation, however, is less clear. While some research has found that depression is a barrier to cessation (Rohde et al., 2004b), other studies have concluded that there are similar rates of cessation in depressed and non-depressed smokers (John et al., 2004a,b). Furthermore, depressive symptoms have been shown to be unrelated to readiness to quit (Prochaska et al., 2004) and one longitudinal study demonstrated that depressed smokers were no more likely than non-depressed smokers to persist in their smoking (Johnson and Breslau, 2006).

Perhaps the inconsistent relations between smoking status and depression are due to differences in the characteristics of the people in the various studies. Depression is associated with both obesity and unhealthy weight-related behaviors such as physical inactivity and binge drinking (Fan et al., 2009; Strine et al., 2008). Smokers who have weight-related behavioral risk factors (low physical activity, high dietary fat intake) appear to have greater nicotine dependence and are somewhat less likely to successfully quit smoking (Sherwood et al., 2000). Given this, the purpose of this study was to explore how weight might influence the relationship between depression and smoking in a sample of middle-aged women. We hypothesized that the relationship between depression and smoking cessation may be different for those who are normal weight, overweight, and obese.

Methods

Data for this study were obtained during November 2003–February 2005 through a population-based survey of women age 40–65 enrolled in Group Health Cooperative, a health plan serving approximately 500,000 members in Washington and northern Idaho. This sample was selected for the larger study that aims to explore depression–obesity relationships because of

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evidence that the association between obesity and depression is stronger in women (Istvan et al., 1992) and because both this age group and women has a relatively high risk of depression compared to other age groups (Kessler et al., 2003). The membership of Group Health Cooperative includes those enrolled through employer-purchased contracts as well as risk-sharing contracts with Medicare and Medicaid. The Group Health enrollment population is demographically representative of the Greater Seattle area's population (Simon et al., 1996). Study participants were recruited from eight clinics that served higher proportions of ethnic minorities. All women over the age of 40 in the plan are periodically invited to complete breast cancer risk questionnaires as part of the Group Health Breast Cancer Screening Program (BCSP) (Taplin et al., 1990). The survey includes self-report of height and weight from which BMI (kg/m^2) was calculated. The primary goal of the survey was to assess the relationship between obesity and depression. In order to have an adequate number of women with high BMIs, women in the target age group were first stratified by BMI category to oversample women with high BMIs. All women with a BMI>30 and 12% of those with a BMI<30 were invited to participate. A sample of women who either did not complete BCSP or whose BMI could not be determined from the questionnaire was also recruited. The overall survey response rate was 61.5%.

Surveys were conducted by telephone and included items on height, weight, race/ethnicity (American Indian or Alaskan Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, White), age, current and past tobacco use, income, marital status (never married; widowed, divorced, or separated; married), education (less than college graduate, college graduate) moderate physical activity (number of times per week), vigorous physical activity (number of times per week) and current and past depression. Current depression was assessed using the Patient Health Questionnaire (PHQ; Spitzer et al., 1999) which uses the nine American Psychiatric Association DSM-IV (American Psychiatric Association, 1994) criteria for the diagnosis of major depression, lifetime depression was assessed using a modified PHQ where questions are modified to ask about the past. Current major depression was categorized as a positive response ("More than half the days" or "Nearly all days") to at least one of two core symptoms (depressed mood or loss of interest) and a total of five positive symptoms. Weight status was classified as: underweight = BMI<18.5, normal = BMI 18.5–24.9, overweight = BMI 25–29.9, obese = BMI>30. For regression analyses, "underweight" and "normal" were combined due to small numbers of underweight women. Current and ever smoking were each assessed by single items ("Do you smoke cigarettes now?", "Have you smoked at least 100 cigarettes in your entire life?"). Those who did not report current smoking but did indicate that they had smoked in the past were categorized as former smokers. All measures were self-reported.

We used both minimally and fully adjusted multiple logistic regression models to estimate associations and 95% confidence intervals. Analyses were conducted using SAS, version 9.13 (SAS Inc., Cary, NC). To account for stratified sampling procedures and differential response rates across strata, analyses incorporated sampling weights (Cochran, 1977) using SAS procedures PROC SURVEYFREQ, PROC SURVEYMEANS, and PROC SURVEYLOGISTIC.

Results

Table 1 shows descriptive statistics for all independent and dependent variables by BMI category. No BMI category was significantly more likely to include either current smokers or quitters; prevalence of lifetime and current depression increased with BMI category. When we examined the associations between current major depression and current smoking, there was a nearly significant association in the minimally adjusted model (adjusted for age and race; OR = 1.70, 95% CI = 0.99–2.86) and a significant association in the fully adjusted model (adjusted for age, race, education, income, marital status, moderate physical activity and vigorous physical

Table 1
Description of the sample by weight category.

Categorical variables		Underweight			Normal weight			Overweight			Obese			Overall	p-value*
		n	Weighted n	%	n	Weighted n	%	n	Weighted n	%	n	Weighted n	%	n	
Ever smoker	No	11	30.0	60.2	370	1046.0	58.3	388	637.7	52.7	1735	791.3	51.5	2504	0.053
	Yes	7	19.8	39.8	265	746.9	41.7	337	573.2	47.3	1483	745.8	48.5	2092	
Current smoker	No	15	41.2	82.7	576	1635.0	91.0	656	1104.0	90.9	2911	1369.0	89.0	4158	0.37
	Yes	3	8.6	17.3	60	160.9	9.0	70	110.1	9.1	308	168.6	11.0	441	
Quitter (among ever smokers only)	No	3	8.6	43.6	59	158.3	21.2	68	105.0	18.3	302	166.5	22.3	432	0.28
	Yes	4	11.2	56.4	206	588.6	78.8	269	468.3	81.7	1181	579.2	77.7	1660	
Current depression	No	19	52.9	100	630	1779.0	98.2	697	1151.0	93.7	3015	1420.0	91.9	4361	<0.001
	Yes	0	0.0	0	12	32.3	1.8	35	77.8	6.3	229	125.6	8.1	276	
Lifetime depression	No	19	52.9	100	620	1753.0	96.9	682	1125.0	92.2	2933	1376.0	89.0	4254	<0.001
	Yes	0	0.0	0.0	21	55.5	3.1	47	95.6	7.8	310	169.3	11.0	378	
Race	American Indian or Alaskan Native	0	0.0	0.0	7	21.3	1.2	23	19.4	1.6	162	73.2	4.7	192	<0.001
	Asian	5	13.2	23.9	66	182.6	10.1	48	97.1	7.9	99	51.6	3.3	218	
	Black or African American	1	3.0	5.5	25	64.7	3.6	53	87.8	7.2	351	166.9	10.8	430	
	Native Hawaiian or Other Pacific Islander	1	3.0	5.5	5	14.2	0.8	7	7.3	0.6	20	15.7	1.0	33	
	White	13	36.1	65.1	541	1532.0	84.4	600	1017.0	82.8	2612	1239.0	80.1	3766	
Marital status	never	5	14.7	27.9	51	144.6	8.0	67	109.6	8.9	421	205.4	13.3	544	<0.001
	widowed, divorced, or separated	3	8.1	15.4	136	375.5	20.7	172	292.6	23.8	887	433.4	28.0	1198	
	married	11	30.0	56.7	457	1295.0	71.3	493	829.1	67.3	1937	907.6	58.7	2898	
College graduate	No	6	17.3	31.2	153	410.5	22.8	256	409.5	33.3	1519	713.5	46.2	1934	<0.001
	Yes	14	38.1	68.8	487	1394.0	77.2	476	819.1	66.7	1723	831.8	53.8	2700	

Continuous variables	n	Mean	SE	n	Mean	SE	n	Mean	SE	n	Mean	SE	Mean	p-value^
Age	20	50.4	1.6	644	51.6	0.3	733	53.0	0.3	3245	52.0	0.2	52.1	0.15
Monthly income	10	3028.5	309.4	492	3737.7	110.8	531	3780.8	145.3	2444	3409.3	74.8	3631.3	0.024
Times/week moderate physical activity	18	6.3	1.1	639	6.6	0.1	729	5.5	0.2	3234	4.5	0.1	5.6	<0.001
Times/week vigorous physical activity	18	3.8	0.9	640	5.0	0.2	728	3.9	0.2	3235	2.6	0.1	3.9	<0.001

November 2003–February 2005, Group Health Cooperative, USA.

Note. Due to small cell counts in the underweight category, underweight and normal weight categories were combined for statistical tests. Totals for each category range from 4596 to 4640 due to missing data on certain survey items.

* Rao–Scott Chi square test for differences between BMI categories.

^ Weighted *t*-test for differences between BMI categories.