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Running Head: OBESITY-RELEVANT BEHAVIORS

Obesity-Relevant Behaviors: Patterns and Correlates in a Hispanic College Sample

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Abstract

Objective

Obesity rates in Hispanic groups and the role of lifestyle factors warrant the investigation of multiple health behaviors for prevention and intervention aims. Patterns and correlates of exercise and dietary behaviors were examined in Hispanic college students.

Participants and Methods

Data were collected from 693 Hispanic undergraduate students during fall 2006 and spring 2007 semesters. Participants completed questionnaires for three health behaviors (exercise, dietary fat, and fruit/vegetable stages of change) along with demographic, psychosocial, and acculturation measures.

Results

Less than 1% of students had 0 obesity-relevant risks, while 68% indicated 2 or more risks. Only 2% of the sample met fruit and vegetable guidelines. Lower income was associated with greater obesity-relevant risks, while stress coping ability was associated with fewer such risks.

Conclusions

These findings indicate high levels of specific obesity risk behaviors in Hispanic college students and suggest specific demographic and psychosocial targets for prevention and intervention.

Keywords: Obesity, Hispanic, multiple health behaviors, exercise, diet

Obesity-Relevant Behaviors: Patterns and Correlates in a Hispanic College Sample

Over two-thirds of Americans (70.6%) are either overweight or obese, while one in three adolescents are overweight or at risk of overweight.[1] Clinical guidelines define adult overweight and obesity as a body mass index (BMI) of 25–29.9 kg/m^2 and ≥30 kg/m^2, respectively.[2] Obesity is a serious health concern as it is associated with a number of preventable or reversible medical complications, including type 2 diabetes,[3] hypertension,[4] elevated cholesterol levels,[5] and coronary heart disease.[6,7]

While obesity rates are increasing across all ethnic groups,[8] certain groups are at greater risk.[1] Hispanics have demonstrated the greatest growth in obesity prevalence in the United States—an 80% increase between 1991 and 1998.[8] In particular, Mexican American adolescents are at greater risk of obesity than non-Hispanic White and non-Hispanic Black adolescents.[9] Data from the National Health and Nutrition Examination Survey from 1992-2002 indicate that over 40% of Mexican American adolescents are overweight, and over 22% are obese.[10] Studies assessing the correlates of obesity in Hispanic subgroups have implicated low physical activity,[11] poor diet,[12,13] acculturation,[14,15] and income and education levels.[10,11,16] Perceived stress and current smoking have also been associated with unhealthy eating behaviors in Hispanics[17] and college students,[18] meriting the investigation of these variables as potential correlates of obesity-promoting behaviors in Hispanic groups.

Given that the highest increases in overweight and obesity occur between 18 and 29 years of age,[8] an examination of activity and eating behaviors is warranted for the development of prevention and intervention efforts. College is a salient transition period for health behavior change in adolescents and young adults.[19, 20] In fact, only 21.4% of Hispanic college students

nationwide regularly engage in moderate physical activity, while less than one-third (31.5%) consume at least five fruits and vegetables daily.[21]

Emergent research suggests that these unhealthy behaviors frequently co-occur, with potentially multiplicative health consequences.[22-25] Berrigan and colleagues[22] note that the most common pattern of health behaviors in U.S. adults involves a lack of adherence to exercise, dietary fat, and fruit and vegetable recommendations. To that end, the rationale underlying research on multiple health behavior change (MHBC) as opposed to single behavior foci is one of maximizing health benefits and reducing healthcare costs.[26]

The transtheoretical model (TTM) is one avenue for tailoring MHBC interventions, as it addresses individual psychosocial and motivational mediators of behavior change.[27] The TTM conceptualizes temporal behavior change along a cyclical continuum of readiness divided into five stages: precontemplation, contemplation, preparation, action, and maintenance.[28] In *precontemplation*, individuals are not considering behavior change within the next six months, while individuals in the *contemplation* stage plan to alter behavior within six months; *preparation* individuals have either taken moderate action or intend to act within one month. Adequate behavior modifications from zero to six months comprise the *action* stage, while the *maintenance* stage entails consistent changed behavior for more than six months.[28]

TTM constructs have been successfully applied to a number of single health behaviors, including smoking,[29, 30] physical activity,[23, 31, 32] and diet.[33] The model's efficacy has been demonstrated in two MHBC interventions on smoking, dietary fat, and sun exposure,[34,35] as well as interventions on physical activity and dietary fat reduction.[36, 37] Yet, the paucity of TTM literature addressing MHBC for ethnic college groups suggests the need for further empirical study.

Given the emerging field of MHBC, evidence of multiple behavior intervention efficacy in college students is limited. One pilot study demonstrated significant increases in physical activity and consumption of healthy fats in college students after a brief image-based intervention,[38] though similar studies in Hispanic college students have yet to be performed.

As such, examining patterns and correlates of physical activity and dietary behaviors using TTM constructs in this cohort serves to critically inform the design and planning of future MHBC interventions in the context of obesity risk. These comprise current study aims. Specifically, this study examined the extent of risk in lack of adherence to physical activity, dietary fat, and 5-A-Day fruit and vegetable recommendations, as well as correlates of risk in Hispanic college students. Relevant correlates include sociodemographic (age, gender, income, acculturation), health-related (smoking status, BMI), and psychosocial (perceived stress, coping ability) constructs. Individuals in this study were hypothesized to report being in earlier stages of change (i.e. not meeting recommendations) for the three behaviors; risk was hypothesized to correlate with high acculturation, low income, high BMI, smoking, and greater perceived stress.

Methods

Participants

Data were collected in 2006-2007 from 693 Hispanic undergraduate students at least 18 years of age in the U.S.–México border region. University undergraduate Hispanic enrollment at the time of data collection (76.1%) nearly perfectly mirrored the Hispanic population in the region (76.6%).[39] Students were 59% female, with an average age of 19.6 years (*SD*=3.33 years).

Design and Procedure

Cross-sectional data were collected after Institutional Review Board approval. Participants provided informed consent and completed seven paper-and-pencil questionnaires assessing

readiness outcomes on three obesity-relevant behaviors, as well as demographic, health related, and stress and coping variables. Students were debriefed and given course credit for voluntary participation.

Measures

Potential Correlates

Age, gender, annual household income, household size (number of household members), and self-reported height and weight (for BMI calculation) were obtained. Annual household income was divided into four distinct groups: Less than US $15,000, between $15,000 and $30,000, between $30,000 and $50,000, and more than $50,000. Household size was included to account for low income scores from single-living students.

The *Rhode Island Stress and Coping Inventory* (RISCI) evaluates perceived stress and coping ability using 12 items.[40] Respondents rate the frequency of items (e.g. "I had no time to relax") within the past month from 1 (Never) to 5 (Frequently). Adequate reliability, internal consistency, and content validity have been demonstrated, as well as high correlations between the RISCI subscales and the five-item Mental Health Inventory.[40] Scores for the stress subscale range from 7 to 35 (higher scores indicate greater perceived stress), while the coping ability subscale ranges from 5 to 25 (higher scores indicate greater coping ability). Adequate reliability was observed in both the 7 item stress subscale ($\alpha = .82$) and the 5 item coping ability subscale ($\alpha = .81$).

The *Short Acculturation Scale for Hispanics* (SASH)[41] assesses the degree to which Hispanics have adopted American culture by measuring three aspects of acculturation: language, media, and ethnic social relations. Acculturation scores range from 1 through 5, with scores averaging above 2.99 indicative of more acculturated respondents. Adequate psychometric

properties have been demonstrated for this 12 item measure,[41] and internal consistency was demonstrated in this sample (α = .91).

Smoking status was assessed using the *Stage of Change for Smoking Cessation (Short Form)*, based on a six-item algorithm measuring readiness to quit smoking along five stages—precontemplation, contemplation, preparation, action, and maintenance.[29]

Obesity-Relevant Outcome Variables

Health behaviors associated with obesity risk were examined. Specifically, recommendations for regular exercise, dietary fat reduction, and fruit and vegetable consumption were examined using a staging algorithm, with low stage of change (SOC) scores suggestive of failure to meet recommendations.

The *Stage of Change for Exercise (Short Form)* places respondents into one of five stages of readiness to exercise based on a single item response to a specific definition: "Regular Exercise is any *planned* physical activity (e.g., brisk walking, aerobics, jogging, bicycling, swimming, rowing, etc.) performed to increase physical fitness. Such activity should be performed *3 to 5 times* per week for *20-60 minutes* per session. Exercise does not have to be painful to be effective but should be done at a level that increases your breathing rate and causes you to break a sweat. Do you exercise regularly according to that definition?" [42]

The *Stage of Change (Dietary Fat)* evaluates intentions to reduce dietary fat using three steps: the first assesses stage classification based on respondents' intentions or actions taken to "consistently avoid eating high fat foods." [43] The second step confirms respondents' perceptions of dietary fat avoidance with actual behavior in 5 items (e.g. "Do you often use light, fat free, or no salad dressing?"), while the final step assigns participants whose perceptions do not match behavior into precontemplation, contemplation, or preparation.[43]

The *Stage of Change (5 A Day)* applies two items to classify stage of change for fruit and vegetable consumption: the first item assesses the number of fruit and vegetable servings consumed per day.[44] The second item evaluates stage of change, in which a response of fewer than five servings is assigned to precontemplation, contemplation, or preparation. Responses of five or more servings are assigned to action or maintenance on a temporal basis.[44]

Statistical Analyses

Stage distributions were reported for each behavior to provide initial insight into TTM motivational constructs. Above all, there were two primary aims for analyses: to examine the extent of obesity risk in lack of adherence to multiple health behavior recommendations, and to identify demographic and other correlates of this increased risk. For the first objective, SOC for each behavior was dichotomized from a 5-stage algorithm to represent obesity risk. Those who reported precontemplation, contemplation, or preparation stages failed to perform or to meet recommendations for the desired behavior and were categorized as being "at risk" (1), while individuals reporting action or maintenance stages were categorized as "not at risk" (0). These variables were then summed to create a composite score ranging from 0 to 3, with higher scores representing increased risk for obesity from dietary and exercise behaviors.

SOC was dichotomized because the proportional odds assumption in the 5 stages could not be met for ordinal regression approaches. In the second aim for analyses, correlates of increased risk (represented by the composite score) were examined using ordinal logistic regression.[45] Predictor variables of interest were age, gender, household income, SASH acculturation score, BMI, smoking status, as well as the RISCI stress and coping scores. All analyses were conducted using STATA 10.1.[46]

Results

Participant characteristics and stage distributions are reported in Table 1 and Figure 1, respectively. Roughly 32% of participants were either overweight or obese. Examining behaviors singly, regular exercise was the only behavior for which more than half of the sample reported no risk. Otherwise, the majority of participants were at risk for lack of adherence to dietary fat and fruit and vegetable recommendations. Notably, only 2% of the sample reported consuming at least 5 fruits and vegetables daily. Consequently, only 1% of this Hispanic sample had 0 obesity related behavioral risks, while most participants (68% of the sample) reported 2 or more risks (see Table 1).

Because of the limited number of individuals reporting 0 health risk behaviors, these individuals were removed from inferential analysis for model stability. The ordinal regression met the proportional odds assumption, χ^2 (10) = 13.17, $p > .22$; it revealed a significant model with three significant predictors of increased risk, χ^2 (10) = 27.39, $p < .01$. Odds ratios (*OR*s) and confidence intervals (*CI*s) are reported in Table 2. Holding other factors constant, those who reported household incomes between $30k-$50k relative to those with household incomes greater than $50k were marginally more likely to report an increase in risk factors (*OR* = 1.48, $p = .07$). However, relative to those who reported annual household incomes above $50k, those with incomes of $15k−$30k were significantly more likely to report more behavioral risks for obesity (*OR* = 1.93, $p < .01$). While the log odds coefficients for those in the $30k-$50k and $15k−$30k income groups did not statistically differ from one another, χ^2 (1) = 1.58, $p > .21$, the observed larger ORs and associated coefficients for the lowest household income categories assessed in this study likely indicates a monotonic negative association between income and obesity risk for Hispanic college students. Notably, increased coping ability was associated with

fewer risk behaviors reported (*OR* = .95, $p < .05$). Finally, age was marginally associated with an increased odds of reporting an additional risk factor for obesity (*OR* = 1.05, $p = .06$; see Table 2).

Comment

Multiple obesity-relevant behaviors (exercise, dietary fat consumption, and fruit/vegetable intake) and correlates were examined in a Hispanic college student sample. Virtually none of the sample adhered to recommendations for all three behaviors, while the majority of students failed to follow guidelines for two or three behaviors concurrently. Results are consistent with findings across adult population groups that suggest the frequent occurrence of multiple risk behaviors.[22,24] Lack of sufficient fruit and vegetable intake comprised the most common behavioral risk, in which 98% of the sample failed to consume at least five fruits and vegetables daily. This finding is higher than the 73% of college students nationwide who do not meet this dietary recommendation.[21] Higher fruit and vegetable consumption among college students has been associated with greater levels of physical activity[47] and inversely correlated with high-fat fried food and fast food intake[48]—salient associations in the context of obesity risk and nontrivial weight gain during the first two years of college.[48] Health education programs and interventions are thus encouraged to incorporate nutritional components to promote fruit and vegetable intake in Hispanic students.

Over half of students in this study did not make efforts to reduce dietary fat, while 42% of individuals reported being in action or maintenance stages for this behavior. Evidence from the only published national college health risk behavior survey suggests that a majority of students already consume low levels of dietary fat (i.e., fewer than 2 servings of high fat foods daily).[21] Thus, it may be that students in this sample were in fact eating or perceiving low levels of fat intake, with little or no intention for reduction. Alternatively, activity and fruit and vegetable

recommendations may be relatively well known to students, while dietary fat is a more recently emerging weight related variable. College students with increased knowledge of dietary guidelines are more likely to adopt healthy eating patterns.[49] As such, dietary fat may be an ideal target for obesity prevention and intervention psychoeducation efforts.

Contrary to predictions, an encouraging majority in this sample reported exercising regularly. These findings are in line with results from one study in which 75% of US college students reported engaging in some form of physical activity.[50] In one cluster analysis, Reedy and colleagues[51] noted that individuals in a "Physically Active" cluster were more likely to increase fruit and vegetable consumption as a result of a tailored intervention. This implicates exercise as a gateway behavior for dietary change.[52] Given that the majority of students in our sample reported action or maintenance stages for exercise, as well as contemplation or preparation stages for fruit and vegetable intake, MHBC interventions that combine activity and dietary based components—particularly as they address self-efficacy and other TTM constructs associated with these stages—may promote healthy eating and exercise behaviors in Hispanic college students.

Correlates of Multiple Risks

Lower socioeconomic status has been widely implicated with multiple risk behaviors in adult populations,[22, 24, 25, 53, 54] and with overweight, obesity, and class II obesity in college students.[50] In one study, Hispanic females with low education were more likely to have a desired BMI in the overweight category, [55] while a separate study found that adolescents with higher socioeconomic status had greater weight awareness and were more likely to adopt healthy weight management methods.[56] Though education level in this study was uniform and high, lower income was nonetheless associated with obesity-relevant risks. Prevention and intervention strategies are thus

encouraged to address healthy weight attitudes, awareness, and management in Hispanic college students with lower income or other socioeconomic indicators. In addition, food environments play a role in students' behavioral and financial choices.[57, 58] As population and policy efforts have targeted children's and adolescents' dietary intake in schools,[59, 60] similar efforts that address availability and cost-containment of healthy foods are encouraged in college settings.

Contrary to hypotheses, perceived stress was not associated with multiple behavioral risks in this study. Higher levels of perceived stress have been associated with weight changes during the first year in college,[61] as well as poor health outcomes in Hispanics.[62] While stress scores were moderate in this cohort, results suggest that Hispanic students confronted with stressors may resort less to unhealthy behaviors (e.g consumption of calorie-rich foods) than to other outlet sources, such as exercise or family support.[63]

Additionally, students who reported higher stress coping ability reported fewer risk behaviors. An increased ability to cope with daily life stressors (using a cognitive/emotional management coping style) has been associated with better physical functioning in Mexican Americans and Mexican immigrants.[62] Further, Chiang and colleagues[63] identified exercise, hobbies, and activities with family as the most frequently cited coping practices among Latino college students. Current and prior findings suggest the examination of specific coping styles (e.g. positive reframing, social support, and acceptance) and their impact on health outcomes to complement other multiple behavior change intervention components.

Greater cigarette consumption has been associated with increased behavioral risks in adult populations.[64] Among college students, current smoking is correlated with more frequent consumption of highly caloric meals at restaurants, less frequent use of exercise facilities, and eating in front of a television.[65] In contrast, smoking in this study was not significantly

associated with multiple risk behaviors. This may be related to the limited number of smokers in the study, and thus reduced power, or the predominantly light smoking nature of our sample and Hispanic college students more generally.[66] That is, low levels of smoking may be less clearly associated with other deleterious health risks.

With regard to Hispanic acculturation and health risks, evidence is mixed in the broad literature. On the one hand, higher acculturation has been implicated with obesity[13, 14, 16] and increased risks such as physical inactivity,[15] poor diet,[12] and poor self-rated health.[67] Still, a number of studies generate contrary or no evidence of the impact of acculturation.[11, 68] The current results are consistent with the latter interpretation in that acculturation may be less strongly related to multiple obesity relevant behaviors than to other salient influences. Socioeconomic indicators, for instance, may be more useful in understanding health behavior change,[69] and may be more fitting in the context of intervention design and planning.

Though roughly one third of the sample was either overweight or obese, BMI was not associated with increased behavioral risks. Similarly, a longitudinal study of first and second year college students found no associations between changes in BMI and changes in exercise and dietary behaviors.[48] Three potential justifications emerge for the current finding. First, young age and other sample characteristics may underlie the lack of association for BMI and multiple risk behaviors. However, that high BMI is evidenced in younger age groups weakens this explanation. Second, the energy balance equation of caloric intake versus expenditure may account for this finding. That is, the majority of individuals met exercise recommendations; however, amounts and intensities of exercise were not assessed. It is possible that students performed exercise at levels that offset the energy balance far in the desired direction, buffering against dietary risks and contributing to observed BMI. Finally, the behavioral measures may not

have captured culturally relevant or detailed estimates of dietary intake or physical activity. For instance, individuals with no intention to reduce dietary fat may have answered "No" to the question, "Do you often eat bread, rolls, or muffins without butter or margarine?" for the reason that these items were not staples in their diets. Carrera and colleagues[70] have identified a "traditional Mexican diet" cluster in which individuals consumed more fruits, vegetables, and fiber (likely from tortillas and legumes) as well as cholesterol and total energy. To that end, more precise estimates of dietary intake may be achieved through food frequency questionnaires, though these were beyond the aims and scope of this study.

Limitations

Results of the study warrant careful interpretation for several reasons. A reliance on self-report may lead to under- or overestimations of BMI or socially desirable health behaviors; however, self-reported height and weight correlate highly with measured BMI in young adults.[71] Obesity-promoting behaviors such as soft-drink consumption or television viewing were not examined and may further inform MHBC intervention planning in Hispanic college groups. As noted, detailed estimates of exercise and dietary behaviors were not assessed, such as percentage of dietary fat from daily caloric intake, types of fats consumed, or types and duration of exercise performed.

Several strengths of the study merit mentioning. Few studies have examined multiple health behaviors in Hispanic college students, one of the fastest growing ethnic minorities entering college.[72] Further, the use of a large, fairly homogenous sample of individuals of Mexican descent enhances generalizability for use by researchers and healthcare providers, perhaps particularly those working within the growing number of Hispanic Serving Institutions.

Conclusions

This study provides an examination of multiple obesity-relevant behaviors in Hispanic college students. Reports of regular exercise and poor nutrition with income and stress coping associations highlight unique patterns and correlates of behaviors contributing to obesity risk. Maximizing health benefits and reducing healthcare costs are two of the aims that drive multiple health behavior change research and are particularly relevant for college health professionals implementing prevention and intervention programs. Future directions include longitudinal studies of multiple health behavior change and the development, implementation, and assessment of interventions tailored to underserved ethnocultural groups.

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Table 1
Participant Characteristics (n = 693)

Categorical Demographics	**%**	**Continuous Variables**	***M***	***SD***
Gender		Age	19.6	3.33
Male	41	BMI	23.9	4.91
Female	59	Acculturation	2.97	0.74
BMI Categories		RISCI Coping	23.2	5.75
Underweight	7	RISCI Stress	17.9	3.61
Normal	61			
Overweight	21.5			
Obese	10.5			
Hispanic Identification		**Risk Variables**	**%**	
Mexican National	14	**Exercise Risk**		
Mexican American	72	No Regular Exercise	37	
Other Hispanic/Latin	14	Regular Exercise	63	
Household Income		**5 a Day Risk**		
>$50k per year	28	No Regular Consumption	98	
$30k to $50k per year	27	Regular Consumption	2	
$15k to $30k per year	33			
Unknown Income	12	**Dietary Fat Risk**		
		No Regular Low Fat Diet	58	
		Low Fat Diet	42	
Reported Smoking Status				
At Least Daily Smoking	6	**Total Risk**		
At Least Weekly Smoking	5	0 Risks	1	
At Least Monthly Smoking	4	1 Risk	31	
Less Than Monthly Smoking	6	2 Risks	43	
Non-Smoker	79	3 Risks	25	

Table 2
Ordinal Logistic Regression of Obesity Relevant Health Behaviors

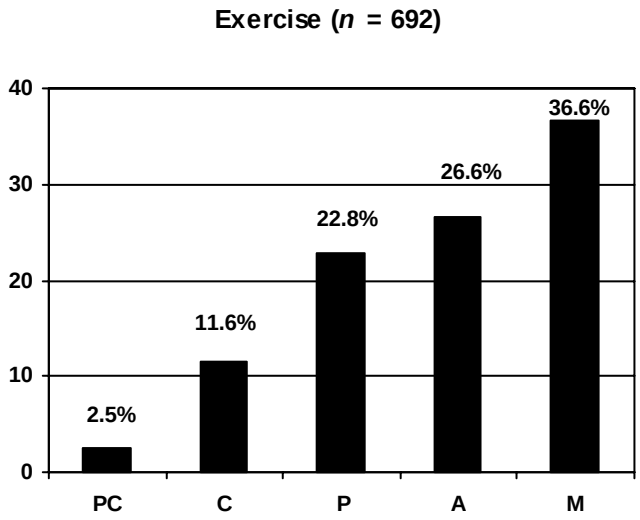
	OR	*p*	95% CI
Age (from 18)	1.05	0.06	1.00 - 1.11
Reported Household Income[1]			
$30k to $50k Income	1.48	0.07	0.97 - 2.27
$15k to $30k Income	1.93	<.01	1.28 - 2.92
Unknown Income	0.89	0.69	0.51 - 1.57
Female Gender (vs. Male)	0.92	0.65	0.66 - 1.29
Acculturation	0.96	0.70	0.76 - 1.20
BMI	0.99	0.57	0.96 - 1.02
Smoking Status[2]	1.31	0.23	0.84 - 2.04
RISCI Stress	1.02	0.11	1.00 - 1.05
RISCI Coping	0.95	0.03	0.91 - 0.99

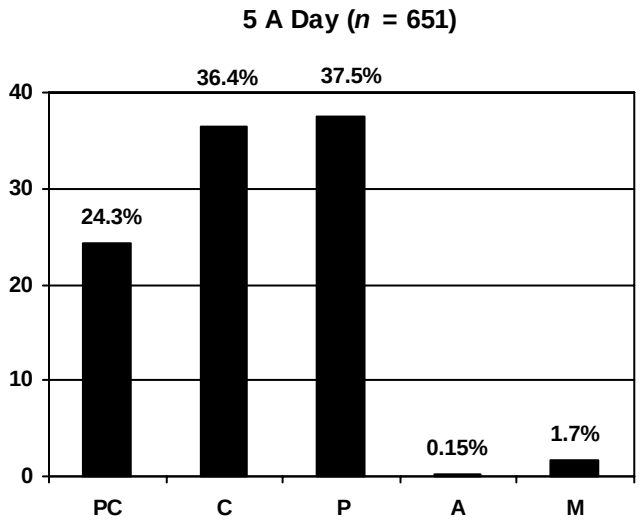
[1]Income reference group is >$50k per year Reported Household Income.

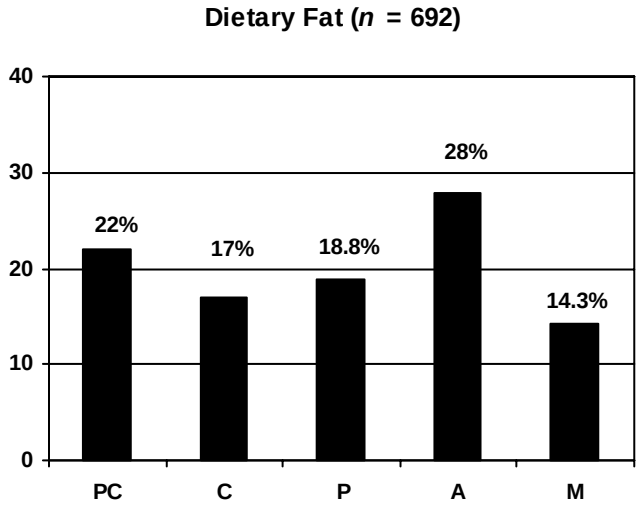
[2]Smoking Status reference group is Non-Smokers.

560 **Figure Caption**

Figure 1. Stage distributions for exercise, 5 A Day, and dietary fat recommendations







Note. PC=Precontemplation, C=Contemplation, P=Preparation, A=Action, M=Maintenance