Wesleyan University

ETHNIC DIFFERENCES IN WEIGHT CONTROL PRACTICES AMONG U.S. ADOLESCENTS FROM 1995 TO 2005

By

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Abstract

Background: Because of a proliferation of media images of ethnic minority models with unrealistic bodies and growing pressure on ethnic minority individuals to conform to White beauty ideals, we explored ethnic differences in trends in weight control practices among adolescents from 1995 to 2005. **Method:** The Youth Risk Behavior Surveillance System (YRBSS) biennially assesses dieting, diet product use, purging, and exercise among nationally representative samples of 10,904 to 16,262 U.S. high school students obtained through 3-stage cluster sampling. **Results:** The prevalence of all weight control behaviors among male adolescents showed significant linear increases during the decade. Black females were less likely than Hispanic females, who were less likely than White females, to practice weight control. White males were less likely than Black males, who were less likely than Hispanic males, to practice weight control. The ethnic differences in weight control practices are consistent across time. **Discussion:** Contrary to expectations, Black females appear to continue to resist social and media pressure to pursue thinness. On the other hand, all male adolescents are at increasing risk for developing eating disorder symptomatology. In light of rising obesity rates, future research needs to differentiate healthy weight control practices from unhealthy weight control practices.

Introduction

Eating disorders are associated with severe physical and mental health consequences. Anorexia nervosa has the highest mortality rates among all psychiatric disorders (Harris & Barraclough, 1998), and unhealthy weight control behaviors practiced by eating disorder patients, such as fasting, purging, and diet product use, lead to electrolyte abnormalities, cardiovascular problems, and osteoporosis (Patrick, 2002; Rome & Ammerman, 2003). Eating disorders are also highly comorbid with major depressive disorder, substance abuse, and anxiety disorders, such as social phobia and obsessive compulsive disorder (Agras, 2001; Hudson, Hiripi, Pope, & Kessler, 2007). Furthermore, adults who had suffered from eating disorders as adolescents are more likely than those who have not to have low self-esteem, be less satisfied with life, have a small social network, and have less support from family members (Striegel-Moore, Seeley, & Lewinsohn, 2003). Lastly, the financial burden of eating disorders is extremely high. Cost of treatment for anorexia nervosa is significantly higher than the cost of treatment for schizophrenia (Simon, Schmidt, & Pilling, 2005; Striegel-Moore, Leslie, Petrill, Garvin, & Rosenheck, 2000), and adults who previously suffered from eating disorders are less likely to attain a bachelor's degree and more likely to be recently unemployed (Striegel-Moore et al., 2003).

Gender Differences in Eating Disorder Symptomatology

Research has repeatedly confirmed the significant gender difference in the prevalence of full-syndrome eating disorders and weight control behaviors among adults and adolescents (Anderson & Bulik, 2004; Hoek, 2006; Hudson et al., 2007;

Neumark-Sztainer & Hannan, 2000; Striegel-Moore & Bulik, in press; Walsh, 2005). Previous research using self-report questionnaires for assessment found that females are ten times more likely than males to suffer from eating disorders (Rastam, Gillberg, & Garton, 1989; Smolak & Striegel-Moore, 2001), but recent research suggested a less pronounced ratio. In a nationally representative study of the prevalence of eating disorders, Hudson et al. (2007) utilized clinical interviews for diagnostic assessment and reported that females are three times more likely than males to suffer from full-syndrome eating disorders.

Sociocultural explanations for the gender difference are abundant. A large body of literature has focused on the social valuation of thinness in females and social pressure on females to be thin in Western cultures. Women are more likely to be rated as attractive, to have dates, and to be hired if they are thin (Yuker & Allison, 1994). Also, the media depicts images of extremely thin women (Spettigue & Henderson, 2004) and promotes objectification of female bodies (Fredrickson & Roberts, 1997). Research supports that the social pressure to be thin has lead to normative body dissatisfaction and dieting among women (Rodin, Silberstein, & Striegel-Moore, 1984), and the internalization of the thin ideal and self-objectification have been found to be strongly associated with disordered eating behaviors (Fredrickson, Roberts, Noll, Quinn, & Twenge, 1998).

Finally, the inherently gendered diagnostic criteria for eating disorders (American Psychiatric Association. Task Force on DSM-IV., 1994) may also explain the gender difference in eating disorder prevalence. Criteria for eating disorder

diagnoses were developed based on empirical data that mainly focused on female eating disorder patients (Watson & Andersen, 2003), and thus describe characteristic symptoms of eating disorders in females. For example, in the Diagnostic and Statistical Manual of Mental Disorders IV (DSM IV; American Psychiatric Association. Task Force on DSM-IV., 1994), one of the criteria for anorexia nervosa is amenorrhea, which can only be observed in women.

Ethnic Differences in Eating Disorder Symptomatology

It has long been assumed that eating disorders in the United States are rare among ethnic minority populations (Smolak & Striegel-Moore, 2001). A prominent explanation for the assumption that eating disorders only afflict White females has been that ethnic minorities are less likely than White populations to be exposed to key risk factors such as the thin beauty ideal, social pressure to be thin, or dieting (Smolak & Striegel-Moore, 2001). Some research has found that Black females have flexible concepts of beauty that emphasize "making what you've got work for you" (Katzman, Hermans, Hoeken, & Hoek, 2004; Parker, Nichter, Nichter, Vuckovic, & et al., 1995), and that compared to White females, Black females prefer a larger body size, feel less pressure from their parents to lose weight, and are more satisfied and comfortable with their bodies (Katzman et al., 2004; Kemper, Sargent, Drane, Valois, & Hussey, 1994; O'Neill, 2003).

However, the current diagnostic criteria for eating disorders (American Psychiatric Association. Task Force on DSM-IV., 1994) were developed from studies of White populations in Western countries (Cummins, Simmons, & Zane,

2005; Mumford, 1993; Wildes & Emery, 2001) and may not apply especially well to non-White populations. Each ethnicity may present eating disorders through a different set of symptoms, and the pattern in ethnic differences may depend on the observed behavior (Crago & Shisslak, 2003; Gilbert, 2003). Indeed, several reviews of disordered eating behaviors found that dieting is more common among White females than minority females, but Black and Hispanic females are more likely than White females to binge eat (Crago & Shisslak, 2003; O'Neill, 2003; Wildes & Emery, 2001).

Trends in Eating Disorder Symptomatology

Trends in the incidence, i.e., the number of new cases, of eating disorders vary by the specific disorder, the age group, the time period, and the geographic region in question. In the United States (U.S.), Lucas, Crowson, O'Fallon, and Melton (1999) conducted a population-based survey in Minnesota and found a significant linear increase in the incidence of anorexia nervosa in females aged 15-24 from 1935 to 1989. On the other hand, in Europe, results from a review of studies based in northern Europe that used hospital records, mental health care facility records, case registers, or large random samples indicated that the incidence of anorexia nervosa in Europe increased through the 1970's and did not change significantly from 1970's to 2000 (Hoek, 2006). Moreover, van Son, van Hoeken, Bartelds, van Furth, and Hoek (2006) used health care records of a nationally representative sample of Dutch adolescents and adults and reported that the overall incidence of anorexia nervosa and bulimia

nervosa did not change significantly from 1985 to 1999, but the incidence of anorexia nervosa among females aged 15 to 19 increased significantly.

Only one study examined trends in the prevalence of eating disorders. Prevalence, or the number of cases at a given period of time, is the function of incidence and chronicity of a disorder. Specifically, Keel, Heatherton, Dorer, Joiner, and Zalta (2006) reported that the prevalence of bulimia nervosa and compensatory behaviors decreased significantly from 1982 to 2002, but they employed a large sample of female and male college students in New Hampshire, not a nationally representative sample. To date, no study has used a nationally representative sample to examine trends in the prevalence of eating disorder symptomatology in U.S. populations.

Gender differences in trends in eating disorder symptomatology. Even though the significant gender difference in the prevalence of eating disorder symptomatology is well established, recent research has suggested that eating pathology may be increasing among males. Research has documented increasing muscularity of action figures (Pope Jr, Olivardia, Gruber, & Borowiecki, 1999) and male magazine models (Law & Labre, 2002; Leit, Pope H.G, & Gray, 2001) as well as a proliferation of media images of unrealistic male bodies (Harvey & Robinson, 2003). These findings indicate that social pressure to achieve the muscular body ideal, as portrayed by the media, is growing.

Moreover, as mentioned earlier, while previous research using self-report questionnaires for assessment supported that females are ten times more likely males

to suffer from eating disorders (Rastam et al., 1989; Smolak & Striegel-Moore, 2001), recent interview-based research indicated that females are now only two to three times more likely than males to suffer from eating disorder symptomatology. In a nationally representative study of the prevalence of eating disorders, Hudson et al.'s (2007) results showed that females are three times more likely than males to suffer from full-syndrome eating disorders. Also, a study utilizing a large sample of adults in Ontario reported that women are two times more likely than men to suffer from full- or partial-syndrome eating disorders (Woodside, Garfinkel, Lin, Goering, Kaplan, Goldbloom et al., 2001). While the changing gender ratio found by epidemiological studies of eating disorders may reflect methodological changes, findings from a clinical setting also support that males are at increased risk for developing eating disorders. From 1984 to 1997, an increasing percentage of males were admitted to an inpatient eating disorder treatment in New York State (Braun, Sunday, Huang, & Halmi, 1999). Finally, Lowry, Galuska, Fulton, Burgeson, and Kann (2005) examined nationally representative samples of U.S. adolescents from 1991 to 2001, and they found that although adolescent girls were consistently more likely than adolescent boys to be trying to lose weight, the percentage of girls trying to lose weight did not change significantly throughout the ten years, while the percentage of boys trying to lose weight increased significantly.

Ethnic differences in trends in eating disorder symptomatology. Cross-cultural studies have shown that globalization has brought the thin ideal and related social norms to many cultures and peoples and that, as a consequence, eating disorder

symptoms ought to be expected to increase world wide (Striegel-Moore & Bulik, in press). Smolak and Striegel-Moore (2001) hypothesized that the increasing "mainstreaming" of ethnic minorities into the popular culture, as reflected in the growing presence of ethnic minority fashion models, famous musicians and television stars, will contribute to an increase in the prevalence of weight control behaviors among ethnic minority females. Also, while previous research has generally found that eating disturbances are more common among White females than minority females (Crago, Shisslak, & Estes, 1996), recent studies examining specific disordered eating behaviors and attitudes in large samples found no ethnic differences. Shaw, Ramirez, Trost, Randall, and Stice (2004) reported that 785 White, Black, and Hispanic adolescents and adults did not differ in numerous eating disorder symptoms (e.g. compensatory behaviors, weight and shape concerns) and associated risk factors (e.g. body dissatisfaction, dieting). Regan and Cachelin (2006) found that 1,225 White, Black and Hispanic men and women were equally likely to vomit and use laxatives, diuretics, and diet pills for weight control purposes. Lastly, Franko, Becker, Thomas, and Herzog's (2007) results from a sample of 5,435 college students also indicated that there was no significant difference in the percentages of White, Black, and Hispanic college students who engaged in binge-eating, restrictive eating, vomiting, or exhibiting amenorrhea.

Adolescents: A Critical Population

The age of onset of eating disorders typically falls in adolescence (Bulik, 2002; Lewinsohn, Striegel-Moore, & Seeley, 2000; Walsh, 2005). With the multiple

stresses of experiencing puberty, undertaking more academic challenges, and developing individual identities, body dissatisfaction increases in adolescence, and adolescents are especially vulnerable to developing disordered eating behaviors (Bulik, 2002; Smolak, Levine, & Gralen, 1993). Biologically, research supports that hormonal changes occurring during puberty activate genes related to the development of disordered eating. Klump et al. (2003) found that only girls who have reached puberty showed genetic heritability for eating disorder symptoms.

The limited research regarding treatment of eating disorders indicates that adolescence is a crucial time for treatment interventions. Treatment in adolescence can prevent the development of more chronic forms of eating disorders, and adolescents who receive treatment are more likely to recover than adults who receive treatment (le Grange & Lock, 2005). Also, while a growing body of research supports the efficacy of family-based therapy in treating anorexia nervosa in adolescents (le Grange & Lock, 2005; Lock & Le Grange, 2005), no psychotherapy has been found to be helpful to adult patients (le Grange & Lock, 2005; Wilson & Shafran, 2005).

Even though adolescents are clearly a critical population to study for both prevention and treatment purposes, few epidemiological studies have been conducted among adolescent samples (Walsh, 2005), and to date, no study has examined the trends of eating disorder symptomatology in U.S. adolescents. Daee et al. (2002) and Walsh (2005) reviewed studies published between 1990 and 2003 regarding the prevalence of eating disorders and weight control behaviors in adolescents, but, in examining their reviews, changes in prevalence over time are difficult to discern

because the studies varied greatly in sample sizes, demographic composition of samples, recruitment procedures, and assessment methods. Also, few of the studies examined employed nationally representative samples.

The Present Study

Because the presentation of eating disturbances may differ by ethnicity and nationally representative data regarding the prevalence of eating disorders among U.S. adolescents is not available, the present study examined the potential changes in the prevalence of weight control behaviors in nationally representative samples of U.S. high school students over the period from 1995 to 2005. We hypothesized that we would observe an increase in weight control behaviors among girls from ethnic minority populations, whereas the prevalence of these behaviors among White girls would remain relatively unchanged. We also hypothesized an increase in weight control behaviors among boys over the ten-year time period. Because of the lack of prior data on weight control behaviors in ethnic minority boys, we did not specify a hypothesis concerning the changes over time by ethnicity for boys. To achieve these aims, we capitalized on the availability of a large public access data base containing data collected as part of the Youth Risk Behavior Surveillance System (YRBSS; Kolbe et al., 1993).

Method

Participants

The YRBSS has been conducted by the Centers for Disease Control and

Prevention (CDC) biennially since 1991, and the present study utilized the data collected in 1995, 1997, 1999, 2001, 2003, and 2005. Each YRBSS used a three-stage cluster sample design to obtain a nationally representative sample of ninth to twelfth grade students in public and private high schools in the United States. In the first stage of sampling, counties were separated into primary sampling units (PSUs), with a county, a sub-area of a larger county, or several smaller adjacent counties forming one PSU. The PSUs were divided into sixteen strata based on the degree of urbanization and percentage of Black and Hispanic/Latino students. PSUs were selected from each strata with the probability of a PSU being selected proportional to the total number of students enrolled in that PSU. In the second stage of sampling, schools with at least one of the grades nine through twelve were selected, once again with the probability of a school being selected proportional to the total number of students enrolled. Schools with higher percentages of Black and Hispanic students were over sampled. In the third stage of sampling, one or two intact classes of either a required subject (e.g., English) or a required period (e.g., first period) were randomly selected from each grade in each school. No substitutes were found for schools that refused to participate. Further details about the YRBSS sampling method have been described previously (Kolbe, Kann, & Collins, 1993). The number of students who completed questionnaires for the 1995 to 2005 YRBSS ranged from 10,904 to 16,262, and the overall response rate ranged from 60% to 69%. Sample characteristics ranged from 45.2-51.3% female; 60.8-67.5% White; 12.5-14.6% Black; 9.8-16.6% Hispanic;

22.9-29.7% 9th grade; 23.9-26.1% 10th grade; 23.1-25.4% 11th grade; and, 21.0-27.2% 12th grade.

Instrument and Procedure

An institutional review board at the CDC approved each YRBSS, and parental consent was obtained before survey administration. Participation was entirely voluntary, and responses were not associated with participant names. Surveys were administered by trained data collectors in classrooms, and students recorded responses on computer scannable answer sheets. Teachers left the classroom during survey administration, and students were seated as far apart as possible.

The YRBSS was designed to assess the prevalence of health-risk behaviors among youth. Variables of interest included demographic variables and weight control behavior variables (dieting, diet product use, purging, and exercise). Specific information is provided about each question because the wording or response choices of some questions changed across study years.

Demographic variables. In all six time points, demographic variables included sex and race/ethnicity (hereafter, "ethnicity"). The 1995 and 1997 survey assessed ethnicity with the following mutually exclusive response choices: White—not Hispanic, Black—not Hispanic, Hispanic or Latino, Asian or Pacific Islander, American Indian or Alaskan Native, and Other. The 1999 to 2005 survey allowed adolescents to choose more than one response category for ethnicity. The modified response choices were: American Indian or Alaska Native, Asian, Black or African American, Hispanic or Latino, Native Hawaiian or other Pacific Islander, and White.

Adolescents were considered “White” if they only selected “White--not Hispanic” or “White” as their response; “Black” if they only selected “Black—not Hispanic” or “Black or African American” as their response; “Hispanic” if they selected “Hispanic or Latino” as one of their responses; and “Other” if they were not classified into one of the previous three categories. Adolescents categorized as “Other” were included in statistical analyses, but because this category is highly diverse, the results are not necessarily indicative of the prevalence rates of weight control behaviors among any particular ethnic minority group within the “Other” category and thus are not reported.

Weight control behaviors. Dieting during the past 30 days was assessed in the 1995 and 1997 surveys with the question, “Did you diet to lose weight or to keep from gaining weight?” The question was modified in the 1999 to 2005 surveys to “Did you eat less food, fewer calories, or foods low in fat to lose weight or to keep from gaining weight?” Diet product use over the past 30 days was assessed in the 1995 and 1997 surveys with the question, “Did you take diet pills to lose weight or to keep from gaining weight?” The question was modified in the 1999 to 2005 surveys to “Did you take any diet pills, powders, or liquids without a doctor’s advice to lose weight or to keep from gaining weight?” Purging behavior over the past 30 days was assessed in each survey with the question, “Did you vomit or take laxatives to lose weight or to keep from gaining weight?” Exercise in the past 30 days was assessed with the question, “Did you exercise to lose weight or to keep from gaining weight?”

Response choices for all questions assessing weight control behaviors were “yes” and “no” across all study years.

Because the question assessing the 30-day prevalence of exercise did not inquire about the intensity of the exercise, we also examined trends in exercising vigorously at the recommended frequency of three days per week (United States. Dept. of Health and Human Services, 2001) *for weight control purposes*. The 1995, 1997, and 2001 to 2005 surveys assessed the frequency of vigorous exercise with the question: “On how many of the past seven days did you exercise or participate in sports activities for at least 20 minutes that made you sweat and breathe hard, such as basketball, jogging, fast dancing, swimming laps, tennis, fast bicycling, or similar aerobic activities?” The 1999 survey assessed vigorous exercise with a shortened version of the original question: “On how many of the past seven days did you exercise or participate in sports activities for at least 20 minutes that made your sweat and breathe hard?” The response choices ranged from “0 days” to “7 days.” Adolescents were considered as exercising vigorously *for weight control* if they responded to the question assessing exercise for weight control with “yes” and responded to the question assessing the frequency of vigorous exercise with “3 days” or above.

Statistical Analyses

Because of the well-established findings of gender differences both in prevalence of and risk factors for weight control behaviors (Striegel-Moore & Bulik, in press), logistic regressions and post-hoc chi-square analyses were conducted

separately for female and male adolescents. To allow the potential for linear and non-linear change, time was treated as a continuous variable with linear, quadratic, and cubic aspects. The linear time variable was assigned coefficients that reflect the biennial administration of the survey: -5, -3, -1, 1, 3, 5. Coefficients for the quadratic time variable were the squares of the coefficients for the linear time variable, and coefficients for the cubic time variable were the cubes of the coefficients for the linear time variable. All predictors were center coded (Kraemer & Blasey, 2004). Sample weights were used in each individual analysis to correct for differences in the probability of selection and to adjust for non-response. Adjustments for the design effects were incorporated into the estimation process implemented by SAS (Version 9.1) survey procedures to generate accurate standard errors (SAS Institute, 2003).

The linear, quadratic, and cubic time variables, an ethnicity variable (White, Black, Hispanic, and Other), and a time-by-ethnicity interaction variable were entered into separate logistic regressions for female and male adolescents to test: (1) linear, quadratic, and cubic time trends in each behavior; (2) ethnic differences for each behavior; and, (3) time-by-ethnicity interactions for each behavior. The linear, quadratic, and cubic time variables were also entered into separate logistic regressions for each gender- and ethnicity-specific subgroup to test time trends in each behavior among each subgroup. Post-hoc chi-square analyses were conducted for significant time trends and interactions. Trend β's were considered statistically significant if the two-tailed p-value was less than or equal to 0.05. Odds ratios (ORs) were considered statistically significant if the 95% confidence interval did not include 1.

Results

Female Adolescents

The prevalence rates of weight control behaviors among female adolescents, odds ratios with 95% confidence intervals of practicing weight control behaviors for each ethnic group, and regression coefficients for trends in weight control practices are shown in Table 1.

Dieting. The prevalence of dieting is graphed by ethnicity in Figure 1. The linear, quadratic, and cubic effects of time on the 30-day prevalence of dieting among female adolescents were significant. Specifically, the prevalence of dieting among females significantly decreased early in the ten-year period (between 1995 and 1997), significantly increased in the middle of the ten-year period (between 1997 and 2001), and significantly decreased again in the most recent years of the survey (between 2001 and 2005). The significant positive linear trend further demonstrated an overall increase in rates of dieting across time despite these significant upward and downward changes in prevalence. Excluding the two years (1995 and 1997) that used a different question to assess dieting behavior, only the quadratic effect of time was significant ($\beta = -0.039$, $p<0.05$). When examining dieting behavior by ethnicity, significantly fewer Black females than White or Hispanic females dieted for weight control. Further, the time-by-ethnicity interaction for dieting was not statistically significant, suggesting that these ethnic differences were consistent across time.

Diet product use. The prevalence of diet product use is graphed by ethnicity in Figure 2. The linear, quadratic, and cubic effects of time on the 30-day prevalence of

diet product use among female adolescents were significant. The prevalence of diet product use among females was similar early in the ten-year period (between 1995 and 1997), significantly increased in the middle of the ten-year period (between 1997 and 2001), and significantly decreased in the most recent years of the survey (between 2001 and 2005). The significant positive linear trend further demonstrated an overall increase in diet product use across time, despite these significant upward and downward changes in prevalence. Excluding the two years (1995 and 1997) that used a different question to assess dieting behavior, only the linear effect of time was significant ($\beta = 0.083$, $p<0.05$). Again, significantly fewer Black females compared to their White or Hispanic counterparts used diet products for weight control. The time-by-ethnicity interaction for using diet products was not statistically significant, suggesting that these differences remained consistent across time.

Purging. The prevalence of purging is graphed by ethnicity in Figure 3. Only the cubic effect of time on the 30-day prevalence of purging among female adolescents was significant. Specifically, the prevalence of purging among females was stable during most of the decade (1995 to 2003) and significantly decreased in more recent years of the survey (2003 to 2005). Similar to findings for dieting and diet product use, significantly fewer Black females than Hispanic females purged for weight control. In contrast to the results for dieting and diet product use, the prevalence of purging among White females did not differ significantly from the prevalence of purging among Black or Hispanic females. The time-by-ethnicity interaction for

purging was not statistically significant, suggesting that these differences were consistent across time.

Exercise. The prevalence of exercise is graphed by ethnicity in Figure 4. The quadratic effect of time on 30-day prevalence of exercise among female adolescents was significant showing substantial fluctuation across the ten years. Specifically, the prevalence of exercise was stable between 1995 and 1997, increased significantly between 1997 and 1999, stabilized again between 1999 and 2001, decreased significantly between 2001 and 2003, and increased significantly again between 2003 and 2005. Again, significantly fewer Black females than White or Hispanic females exercised for weight control. Additionally, significantly fewer Hispanic females than White females exercised for weight control. The time-by-ethnicity interaction for exercise was not statistically significant, suggesting that these differences remained consistent across time.

Vigorous Exercise. The prevalence of vigorous exercise is graphed by ethnicity in Figure 5.The quadratic effect of time on the 7-day prevalence of vigorous exercise among female adolescents was significant. Changes in the prevalence of vigorous exercise mirrored changes found in exercise, with the exception that the prevalence of vigorous exercise was stable between 2003 and 2005. Significantly fewer Black females than White or Hispanic females vigorously exercised for weight control, and significantly fewer Hispanic females than White females reported vigorous exercise. A significant time-by-ethnicity interaction ($p<0.01$) showed that these ethnic differences were generally consistent across time except in the most recent year of the

survey. In 2005, although the prevalence of vigorous exercise among Black females was still significantly lower than the prevalence among White or Hispanic females, the prevalence of vigorous exercise among White females was no longer significantly different from the prevalence among Hispanic females.

Male Adolescents

The prevalence rates of weight control behaviors among male adolescents, odds ratios with 95% confidence intervals of practicing weight control behaviors for each ethnic group, and regression coefficients for trends in weight control practices are shown in Table 2.

Dieting. The prevalence of dieting is graphed by ethnicity in Figure 6. The linear, quadratic, and cubic effects of time on the 30-day prevalence of dieting among male adolescents were significant. Specifically, the prevalence of dieting significantly increased during the first half of the decade (between 1995 and 2001), was stable between 2001 and 2003, and decreased significantly between 2003 and 2005. The significant positive linear trend further indicated an overall increase in dieting across time, despite these significant upward and downward changes in prevalence. Excluding the two years (1995 and 1997) that used a different question to assess dieting behavior, only the linear effect of time was significant ($\beta = 0.082$, $p<0.01$). When examining dieting behavior by ethnicity, significantly more Hispanic males than White or Black males dieted for weight control. The time-by-ethnicity interaction for dieting was not statistically significant, suggesting that these ethnic differences were consistent across time.

Diet product use. The prevalence of diet product use is graphed by ethnicity in Figure 7. The linear, quadratic, and cubic effects of time on the 30-day prevalence of diet product use among male adolescents were significant. The prevalence of diet product use among male adolescents increased significantly throughout most of the decade (between 1995 and 2003) and decreased significantly in the most recent years of the survey (between 2003 and 2005). Despite the significant decrease in prevalence between 2003 and 2005, the significant positive linear trend further demonstrated an overall increase in diet product use across time. Excluding the two years (1995 and 1997) that used a different question to assess diet product use, only the linear ($\beta = 0.135$, $p<0.05$) and cubic ($\beta = -0.016$, $p<0.05$) effects of time were significant. Similar to the findings for dieting, significantly fewer White males than Hispanic males used diet products for weight control, but in contrast to the results for dieting, the prevalence of diet product use among Black males did not differ significantly from the prevalence among Hispanic males. A significant time-by-ethnicity interaction was found for diet product use among male adolescents ($p<0.01$). While the prevalence of diet product use increased significantly among White and Hispanic boys, the prevalence of diet product use among Black boys was stable.

Purging. The prevalence of purging is graphed by ethnicity in Figure 8. The linear and cubic effects of time on the 30-day prevalence of purging among male adolescents were significant. Specifically, the prevalence of purging among male adolescents did not change significantly in the beginning of the ten-year period (between 1995 and 1999), increased significantly in the middle of the ten-year period

(between 1999 and 2003), and decreased significantly in the most recent years of the survey (between 2003 and 2005). Similar to the findings for diet product use, significantly fewer White male adolescents than Black or Hispanic male adolescents purged for weight control. A significant time-by-ethnicity interaction for purging ($p<0.01$) showed that these ethnic differences were generally consistent across time except in 2001 and 2005. In 2001, the prevalence of purging among White male adolescents was not significantly different from the prevalence among Hispanic male adolescents, although it was still significantly less than the prevalence among Black male adolescents; and, in 2005, the prevalence of purging among White male adolescents was not significantly different from the prevalence among Black male adolescents, although it was still significantly less than the prevalence among Hispanic male adolescents.

Exercise. The prevalence of exercise is graphed by ethnicity in Figure 9. The linear and quadratic effects of time on the 30-day prevalence of exercise among male adolescents were significant. Similar to the trend among females, the prevalence of exercise among males fluctuated substantially across the ten years. Specifically, the prevalence of exercise among male adolescents was stable between 1995 and 1997, increased significantly between 1997 and 1999, stabilized again between 1999 and 2001, decreased significantly between 2001 and 2003, and increased significantly again between 2003 and 2005. However, in contrast to the trend among females, the significant positive linear trend indicated an overall increase in exercise across time despite the significant fluctuation in prevalence. Similar to the findings for dieting

regarding ethnic differences in prevalence rates, statistically significantly more Hispanic males than White or Black males exercised for weight control, but the small OR of 1.2 indicates that the magnitude of the difference in prevalence rates is small. The time-by-ethnicity interaction for exercise was not statistically significant, suggesting that these ethnic differences were consistent across time.

Vigorous Exercise. The prevalence of vigorous exercise is graphed by ethnicity in Figure 10. The linear and quadratic effects of time on the 7-day prevalence of vigorous exercise among male adolescents were significant. Changes in the prevalence of vigorous exercise mirrored changes found in exercise, with the exception that the prevalence of vigorous exercise was stable between 1999 and 2003. Findings regarding ethnic differences in prevalence rates differed from findings for exercise: significantly fewer Black males vigorously exercised than White or Hispanic males. The time-by-ethnicity interaction for vigorous exercise was not significant, suggesting that these ethnic differences remained consistent across time.

Discussion

The prevalence of dieting and diet product use among female adolescents and the prevalence of all weight control behaviors among male adolescents showed significant linear increases between 1995 and 2005. Excluding the two years that used a different question to assess dieting behavior, the linear effect of time on dieting among female adolescents was no longer significant, suggesting that the linear increase previously found for dieting among females was mainly a result of a change

in the assessment question for dieting. The prevalence of all weight control behaviors among female and male adolescents also showed significant non-linear changes in the ten-year period, although the specific changes differed greatly by gender and by behavior. Generally, the data suggest that among girls, Black female adolescents are the least likely to practice weight control, and White female adolescents are the most likely to practice weight control. In contrast, among males, White male adolescents are the least likely to practice weight control, and Hispanic male adolescents are the most likely to practice weight control. Lastly, the ethnic differences in weight control practices have not been decreasing across time.

Adolescent BMIs have been increasing since 1988 (Ogden, Flegal, Carroll, & Johnson, 2002), and the lack of a corresponding linear change in dieting, exercise, and vigorous exercise among female adolescents indicates that female adolescents are not properly dealing with their increasing weight. On the other hand, diet product use and purging are unhealthy behaviors that lead to severe medical complications (Patrick, 2002; Rome & Ammerman, 2003), and the prevalence of these behaviors and the significant linear increase in diet product use among females are concerning. However, it is encouraging that the prevalence of purging among female adolescents has decreased greatly (between 2003 and 2005).

Among male adolescents, the prevalence rates of all weight control behaviors have been rising. This result is consistent with reports of a growing percentage of males being admitted to an inpatient eating disorder treatment from 1984 to 1997 (Braun et al., 1999) and findings of increasing muscularity of action figures (Pope Jr

et al., 1999) and male magazine models (Law & Labre, 2002; Leit et al., 2001). These results support that the social pressure for men to achieve unrealistic body ideals is growing and suggest that male adolescents are at increased risk of experiencing body dissatisfaction and developing eating disorder symptomatology. Considering that males have negative attitudes toward treatment-seeking and are less likely than females to seek treatment (Courtenay, 2003), efforts should be made to increase awareness of eating disorder symptomatology in male adolescents, and future prevention efforts should target male as well as female adolescents.

Similar to previous studies (Crago & Shisslak, 2003; Neumark-Sztainer, Story, Falkner, Beuhring, & Resnick, 1999), we found that among female adolescents, Black females are the least likely and White females are the most likely to practice weight control. This result is consistent with findings that Black females have flexible concepts of beauty and emphasize "making what you've got work for you," and thus are more satisfied and comfortable with their bodies (Katzman et al., 2004; Parker et al., 1995).

On the other hand, results for male adolescents showed almost the opposite pattern of ethnic differences, with White male adolescents being the least likely and Hispanic male adolescents being the most likely to practice weight control. Because of the lack of research on weight control practices and body image among ethnic minority males, we are not clear about why more ethnic minority males than White males reported weight control behaviors. We speculate that this may be a result of the higher prevalence of overweight among Hispanic male adolescents (Ogden et al.,

2002). Another possible reason might be the strong emphasis on athletic performance among Black males (Beamon & Bell, 2002). Future studies need to investigate this and other possible explanations for Black and Hispanic male adolescents' increased likelihood of practicing weight control behaviors.

Furthermore, because of racial stereotypes associating eating disorders with White populations, disordered eating behaviors are detected less often in minority populations than White populations (Becker, Franko, Speck, & Herzog; Gordon, Perez, & Joiner, 2002). The fact that minority male adolescents are more likely than their White counterparts to develop eating disorder symptomatology but less likely to receive professional help is particularly concerning. Efforts should be made to increase the public and clinicians' awareness that individuals of all genders and ethnicities are vulnerable to developing eating disorders.

The finding that ethnic differences in weight control behaviors are not decreasing not only is surprising considering the apparent growing media and cultural pressure for individuals of all ethnicities to adhere to a single thin beauty ideal, but also conflicts with recent research (Franko et al., 2007; Regan & Cachelin, 2006; Shaw et al., 2004). Perhaps the emphasis on "making what you've got work for you" among Black females prevents them from being influenced by media messages. However, from another perspective, considering the toxic food environment that encourages high consumption of nutritionally deficient foods (Wadden, Brownell, & Foster, 2002), consistently embracing one's body type may carry its own risk. Black females' and White males' decreased tendency to practice weight control in general

may put them at risk for becoming overweight. Indeed, Heinburg, Thompson, and Matzon (2001) proposed that some body image concern may be helpful because it may lead individuals to engage in healthy weight control practices.

Limitations and Future Directions

Limitations of the present study include the cross-sectional, instead of longitudinal, design; possible errors in self-report; the inconsistent phrasing of the assessment questions; and, the lack of assessment of related variables in all or some years, including binge eating, the frequency and intensity of the weight control behaviors, BMI, socioeconomic status, and acculturation.

Binge eating is a criterion for the diagnosis of bulimia nervosa and binge eating disorder, the most prevalent of all DSM-IV defined eating disorder syndromes (American Psychiatric Association. Task Force on DSM-IV., 1994; Hudson et al., 2007). As mentioned previously, binge eating is one of the few disordered eating behaviors that is more prevalent among Black females than White females (Crago & Shisslak, 2003). Assessment of binge eating is difficult because it involves the complexities of determining whether an amount is large and whether a feeling can be characterized as loss of control, and self-report questionnaires overestimate the prevalence of binge eating (Fairburn & Beglin, 1994). However, even if conducting follow-up interviews with YRBSS participants who endorse binge eating is not possible, including a question about binge eating in future YRBSS questionnaires would still provide valuable information.

Future YRBSS should also assess the frequency and intensity of weight control behaviors. An adequate amount of dietary restriction and exercise are necessary to maintain a healthy lifestyle, but extreme dieting and excessive exercise lead to serious health problems and can trigger eating disorders (Davis, Kennedy, Ravelski, & Dionne, 1994; Patton, Selzer, Coffey, Carlin, & Wolfe, 1999). Assessing the frequency and intensity of weight control behaviors will help us better understand the percentage of adolescents engaging in healthy or unhealthy weight control.

Furthermore, recent research suggests that ethnic differences in BMI may account for ethnic differences in eating disorder symptomatology. Elevated BMIs have been found to be associated with body dissatisfaction, dieting, and the onset of bulimic symptoms (Pastore, Fisher, & Friedman, 1996). When adjusting for BMI, Arriaza and Mann (2001) found the ethnic differences were no longer significant. However, Black and Hispanic females have higher BMIs (Ogden et al., 2002), but Black females also exhibit less eating pathology, suggesting that the relationship between BMI and eating disorder symptomatology is complicated by ethnicity. Crago and Shisslak (2003) suggest that perhaps perceived weight, and not BMI, may explain the ethnic differences in the prevalence of disordered eating behaviors, and research does support that perceived weight is strongly correlated with weight control practices (Desmond, Price, Gray, & O'Connell, 1986; Forman-Hoffman, 2004; Story, Hauck, Broussard, White, Resnick, & Blum, 1994; Strauss, 1999). Because the YRBSS did not assess BMI in 1995 and 1997, we did not examine the relationship between BMI, ethnicity, and trends in eating disorder symptomatology.

The study should be replicated utilizing YRBSS data from 1999 onward to further understand this issue.

Moreover, the influence of socioeconomic status on eating disorder symptomatology has not been examined in much of the literature, because many studies utilize samples of convenience, such as college students, that often share the same socioeconomic status. However, several studies have found that individuals of high socioeconomic status are more likely to suffer from anorexia nervosa (Lindberg & Hjern, 2003; McClelland & Crisp, 2001; Walters & Kendler, 1995). These studies either used parental education, parental occupation, or a combination of these two variables as an indicator of socioeconomic status. Because Black and Hispanic individuals generally earn less income and attain less education than White individuals (DeNavas-Walt, Cleveland, & Webster, 2003; Stoops, 2004), socioeconomic status may mediate the relationship between ethnicity and eating disorder symptomatology. The YRBSS did not assess socioeconomic status, so we were not able to further examine the relationship between socioeconomic status, ethnicity, and eating disorder symptomatology. Future YRBSS assessments should include questions assessing socioeconomic status.

Minority populations may also have been experiencing more stress to acculturate to Western cultures over the past ten years. Some research found that acculturated individuals are more likely to exhibit disordered eating behaviors, suggesting that either the acceptance of the thin Western beauty ideal or the stress of acculturation may increase risk for eating pathology (Becker, Fay, Gilman, &

Striegel-Moore, 2007; Miller & Pumariega, 2001; Perez, Voelz, Pettit, & Joiner, 2002), but other studies reported the opposite results, proposing that the stress from not acculturating increases the likelihood of developing eating disturbances (Smolak & Striegel-Moore, 2001). Yet other research indicated that acculturation is only associated with eating disorder symptomatology within certain ethnicities (Smolak & Striegel-Moore, 2001) or that acculturation does not affect risk for eating disorder symptomatology (Wildes & Emery, 2001). The conflicting findings regarding the relationship between acculturation and eating disturbances may reflect the inconsistent measures and operational definitions of acculturation used in these studies (Becker & Fay, 2006). Because the YRBSS did not assess any form of acculturation, we were not able to investigate the relationship between acculturation, ethnicity, and trends in eating pathology. Future research should determine which aspects of acculturation are significantly associated with eating disorder symptomatology.

The present study focused on differences between White, Black, and Hispanic populations in time trends in weight control practices. To date, no study has examined time trends in weight control behaviors or full-syndrome eating disorders among Asian American populations in the U.S. or Europe, nor has any study investigated time trends in eating disorder symptomatology in countries in South America or Asia. Recent research found that the prevalence rate of eating disorders among Asian Americans in the U.S. is low (Nicdao, Hong, & Takeuchi, in press), but possibly because the presentation of eating disorders among Asian Americans may differ from

that among White populations, with Asian Americans reporting somatic and behavior symptoms but not attitudinal symptoms (Cummins et al., 2005).

Lastly, a growing body of research has found a relationship between sexuality and eating disorder symptomatology. Austin, Ziyadeh, Kahn, Camargo, Colditz & Field (2004) reported that compared with boys and girls who identified as "heterosexual," "mostly heterosexual" boys and girls and "gay/bisexual" boys had more disordered eating behaviors (e.g. binge eating) and attitudes (e.g. high weight and appearance concerns). Also, results from Wichstrom's (2006) study of a nationally representative sample of Norwegian high school students showed that for males, sexual attraction to the same sex predicted bulimic symptoms five years later. We were not able to confirm the association between sexuality and eating pathology because the YRBSS did not assess sexual orientation. Future YRBSS assessments should include a question about sexual orientation, especially considering that research has found a correlation between sexuality and other psychological and physical health concerns (Case, Austin, Hunter, Manson, Malspeis, Willett et al., 2004). A deeper understanding the characteristics of the adolescents practicing weight control will allow the planning of effective, targeted intervention programs.

These limitations notwithstanding, this study is one of the first studies to utilize ten years of data from large, nationally representative samples of adolescents to examine trends and ethnic differences in weight control behaviors. Males, especially ethnic minority males, are under studied in this field, and this study provides key information about the prevalence of weight control practices in a large,

diverse sample of male adolescents and raises important questions about the factors contributing to the ethnic difference in weight control practices among male adolescents.

Conclusion

In short, the prevalence of all weight control behaviors significantly increased among male adolescents between 1995 and 2005, suggesting that male adolescents are at increased risk for developing eating disorders and that prevention efforts should target males as well as females. Also, similar to previous studies, Black female adolescents were the least likely to report practicing weight control, and White female adolescents were the most likely to practicing weight control. Conversely, White male adolescents were the least likely and Hispanic male adolescents being the most likely to practice weight control, and future research should investigate underlying reasons for ethnic minority male adolescent's increased likelihood for practicing weight control. Finally, contrary to our hypothesis, the ethnic differences in weight control practices have not been decreasing across time.

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Table 1. Weight control practices among U.S. female adolescents 1995-2005: Prevalence, odds ratios, and regression coefficients for trends

	Prevalence									Trend β		
	1995	1997	1999	2001	2003	2005	Average	OR	95% CI	Linear	Quadratic	Cubic
Dieting (30 day)	47.8	45.7	56.2	58.6	56.2	54.8	53.8			0.085***	-0.009***	-0.002**
White	52.5	47.9	60.3	63.1	61.1	58.8	57.5		referent	0.113***	-.009***	-.003***
Black	31.9	33.9	43.4	40.2	39.0	39.6	38.2	0.5	0.4-0.6	0.014	-0.010**	0.001
Hispanic	48.2	46.3	51.0	56.5	54.9	53.2	52.2	0.9	0.7-1.0	0.079**	-0.004	-0.002
Diet Product Use (30 day)	8.7	8.0	10.9	12.6	11.3	8.1	10.0			0.098***	-0.015***	-0.004***
White	10.2	8.5	11.8	13.6	13.0	9.2	11.1		referent	0.117***	-0.012**	-.005***
Black	4.0	5.0	6.9	7.5	5.1	4.9	5.6	0.5	0.4-0.8	0.001	-0.020*	0.001
Hispanic	8.6	9.6	11.0	13.5	11.7	7.5	10.4	1.0	0.8-1.3	0.078	-0.019**	-0.004
Purging (30 day)	7.6	7.5	7.5	7.8	8.4	6.2	7.5			0.040	-0.006	-0.002*
White	8.2	7.5	7.0	8.2	8.5	6.7	7.7		referent	0.057	-0.002	-0.003*
Black	4.1	6.3	6.8	4.2	5.6	4.0	5.3	0.8	0.5-1.1	-0.075	-0.015	0.003
Hispanic	10.9	10.4	6.4	10.8	9.7	6.8	9.0	1.3	1.0-1.7	0.068	-0.001	-0.005*
Exercise (30 day)	63.8	65.4	67.5	68.4	65.7	67.4	66.5			-0.001	-0.004*	0.001
White	69.6	69.7	70.0	72.5	69.6	69.8	70.2		referent	0.012	-0.003	-0.000
Black	49.1	49.2	58.6	53.4	49.2	56.5	52.8	0.4	0.3-0.5	-0.038	-0.004	0.003*
Hispanic	61.3	64.5	65.1	66.2	64.1	68.9	65.2	0.7	0.6-0.8	-0.019	-0.000	0.002
Vigorous Exercise (7 day)	40.3	41.2	44.0	44.9	42.4	43.3	42.8			0.008	-0.004*	0.000
White	45.9	46.1	47.0	49.2	46.2	46.2	46.8		referent	0.010	-0.003	-.000
Black	25.0	25.7	33.4	31.5	28.7	30.9	29.3	0.4	0.3-0.5	0.005	-.008*	0.001
Hispanic	35.5	38.8	38.8	39.7	39.3	45.9	40.0	0.7	0.6-0.7	-0.014	0.003	0.002

*p<0.05, **p<0.01, ***p<0.0001

Table 2. Weight control practices among U.S. male adolescents 1995-2005: Prevalence, odds ratios, and regression coefficients for trends

	Prevalence									Trend β		
	1995	1997	1999	2001	2003	2005	Average	OR	95% CI	Linear	Quadratic	Cubic
Dieting (30 day)	16.0	17.6	25.0	28.2	28.9	26.8	23.8			0.118***	-0.013***	-0.002**
White	15.7	16.6	25.1	27.6	29.1	26.4	23.3		referent	0.130***	-.013***	-.002**
Black	11.7	15.6	25.3	24.5	21.8	22.0	20.5	1.0	0.8-1.3	0.033	-.023***	0.002
Hispanic	23.5	22.6	29.4	32.7	33.7	31.5	29.5	1.5	1.3-1.8	0.107**	-0.007	-0.003
Diet Product Use (30 day)	1.9	2.4	4.4	5.5	7.1	4.6	4.3			0.219***	-0.023***	-0.005**
White	1.1	1.9	4.5	5.2	6.8	4.2	4.0		referent	0.225***	-.035***	-0.003
Black	3.6	3.6	4.1	4.4	4.9	5.1	4.3	2.1	1.3-3.6	0.056	0.001	-0.001
Hispanic	2.8	4.1	6.4	6.7	9.3	5.7	6.2	2.4	1.6-3.6	0.174**	-.022*	-0.004
Purging (30 day)	2.2	2.1	2.2	3.0	3.8	2.8	2.7			0.155***	-0.002	-0.005**
White	1.3	1.6	1.5	2.3	2.7	2.3	1.9		referent	0.144*	-0.005	-0.004
Black	4.3	4.0	3.4	3.8	5.0	2.8	3.9	3.9	2.2-6.9	0.087	-0.003	-0.005
Hispanic	4.1	3.2	4.0	3.5	5.1	3.9	4.1	3.2	2.1-5.0	0.102	0.002	-0.004
Exercise (30 day)	39.3	39.9	49.5	51.0	49.0	52.9	46.9			0.059***	-0.006**	-0.000
White	39.9	38.6	48.7	50.9	48.1	51.2	46.0		referent	0.072***	-.006**	-0.001
Black	34.6	37.5	47.6	46.6	46.1	51.6	44.5	0.8	0.7-1.0	0.033	-.006	0.002
Hispanic	42.5	47.9	55.5	56.8	53.7	63.0	54.1	1.2	1.1-1.4	0.007	-0.004	0.003*
Vigorous Exercise (7 day)	32.4	31.0	39.0	39.5	38.5	41.2	36.8			0.053***	-0.004*	-0.001
White	33.7	30.4	40.0	40.0	39.3	40.9	37.2		referent	0.070***	-0.004	-0.001
Black	24.6	26.9	30.9	35.6	32.0	36.2	31.2	0.7	0.6-0.8	0.044	-0.005	0.000
Hispanic	32.8	35.7	44.4	43.4	39.5	49.2	41.3	1.1	0.9-1.3	-0.013	-0.003	.003**

*p<0.05, **p<0.01, ***p<0.0001

Figure 1. Prevalence of Dieting
Among Female Adolescents by Ethnicity

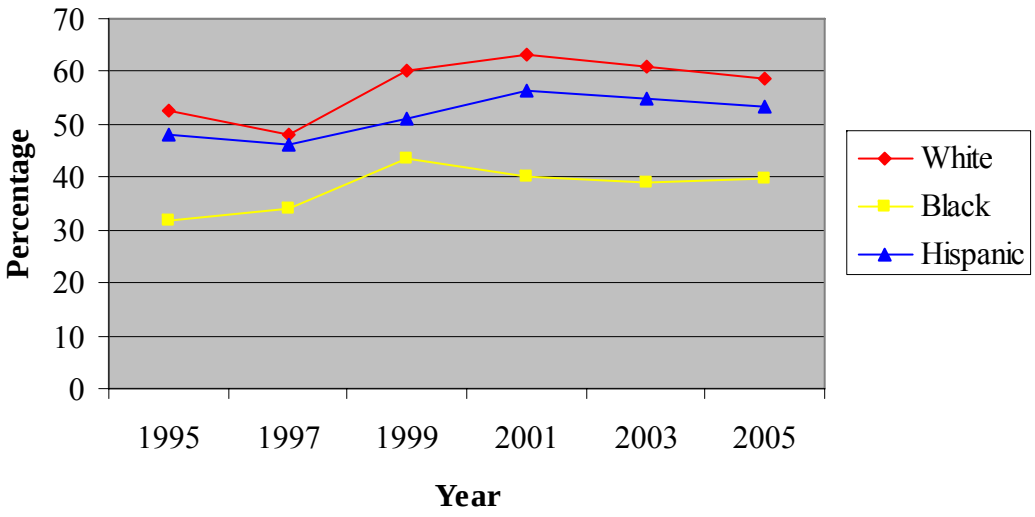

Figure 2. Prevalence of Diet Product Use
Among Female Adolescents by Ethnicity

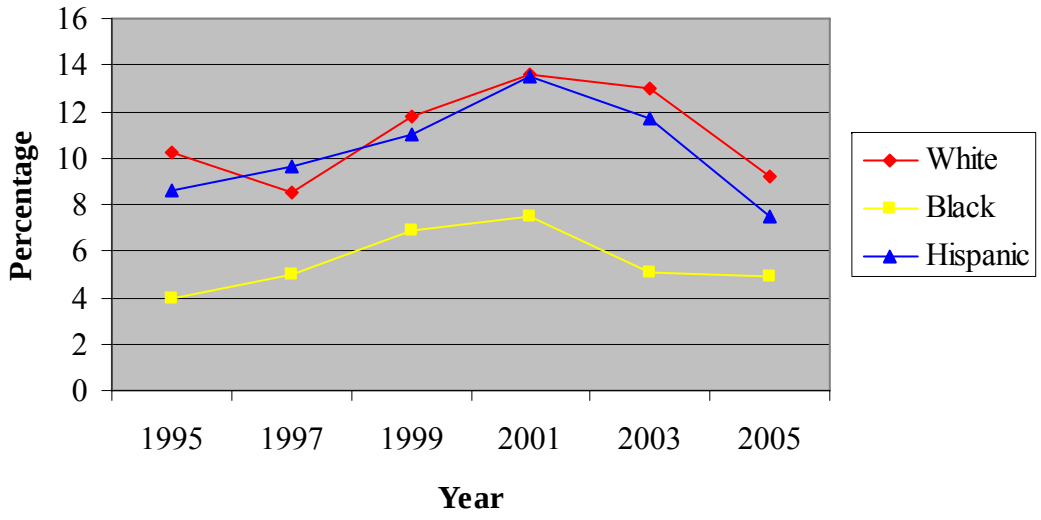

Figure 3. Prevalence of Purging
Among Female Adolescents by Ethnicity

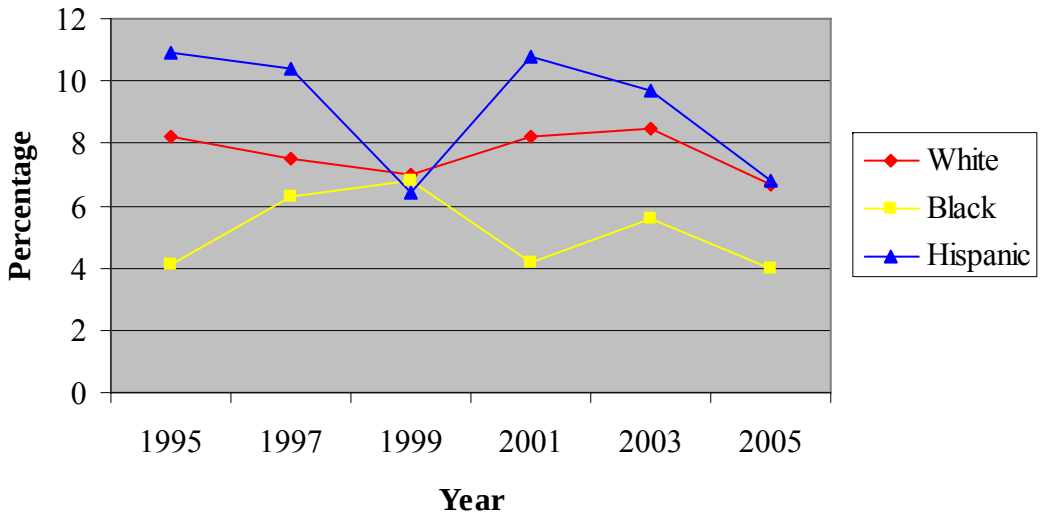

Figure 4. Prevalence of Exercise
Among Female Adolescents by Ethnicity

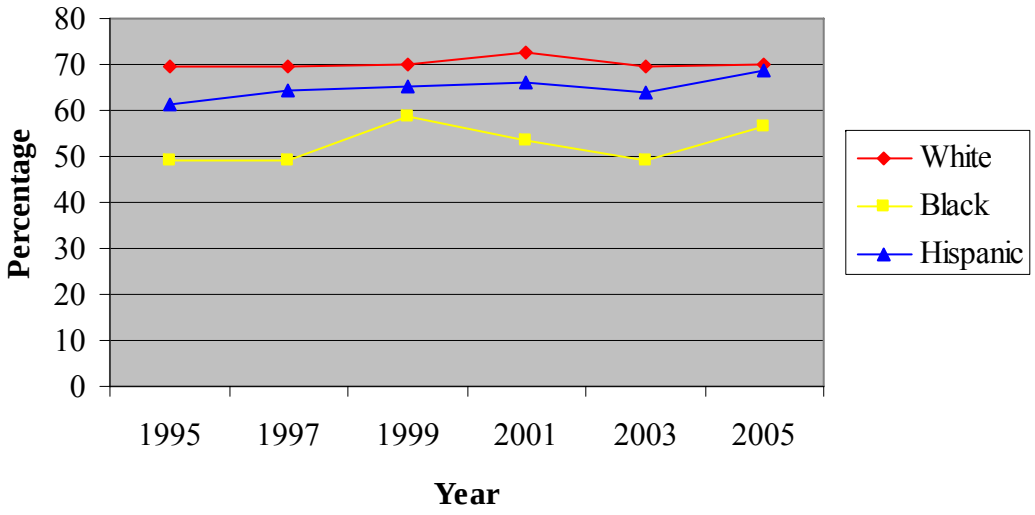

Figure 5. Prevalence of Vigorous Exercise Among Female Adolescents by Ethnicity

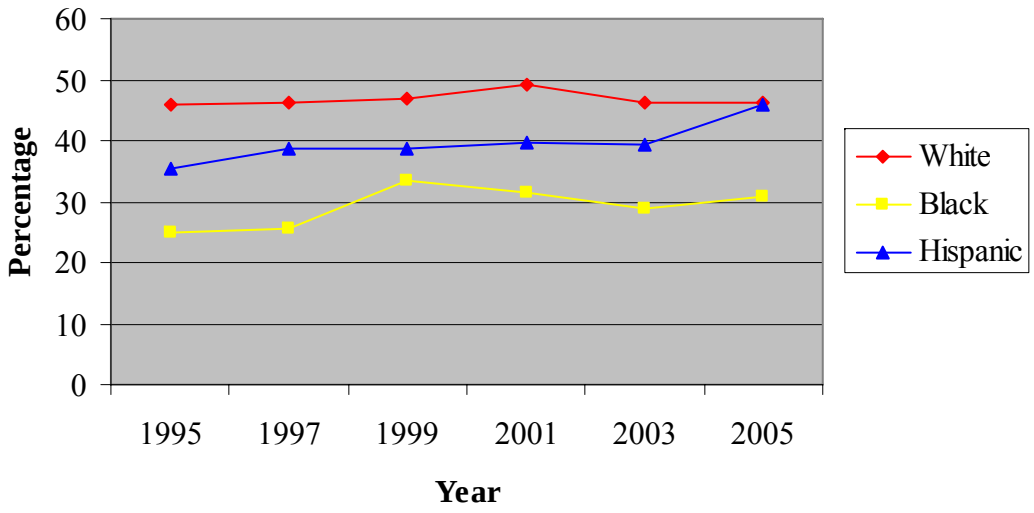

Figure 6. Prevalence of Dieting
Among Male Adolescents by Ethnicity

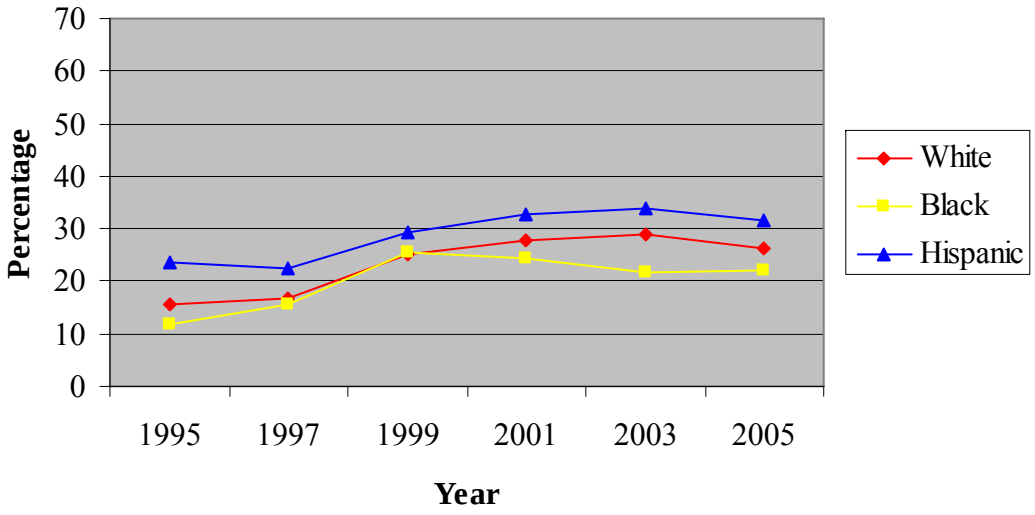

Figure 7. Prevalence of Diet Product Use
Among Male Adolescents by Ethnicity

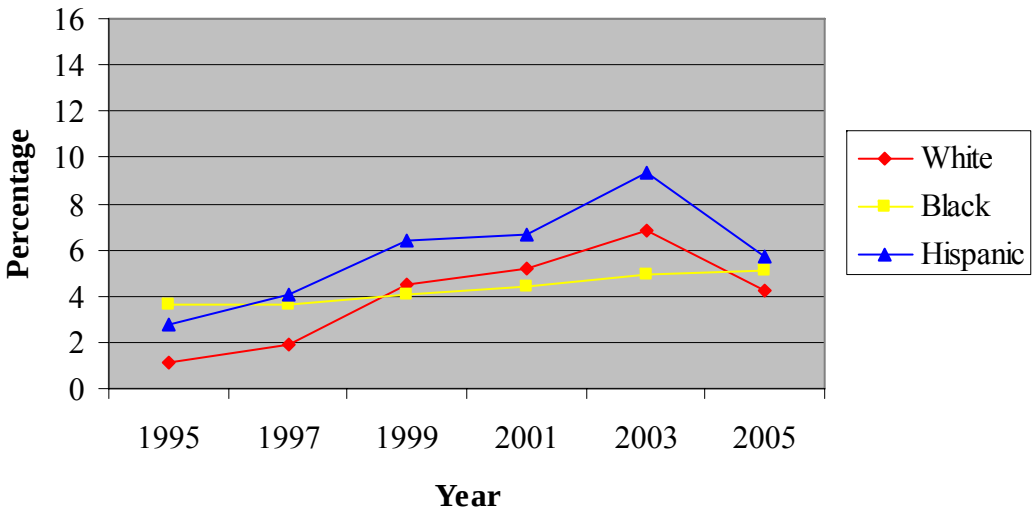

Figure 8. Prevalence of Purging
Among Male Adolescents by Ethnicity

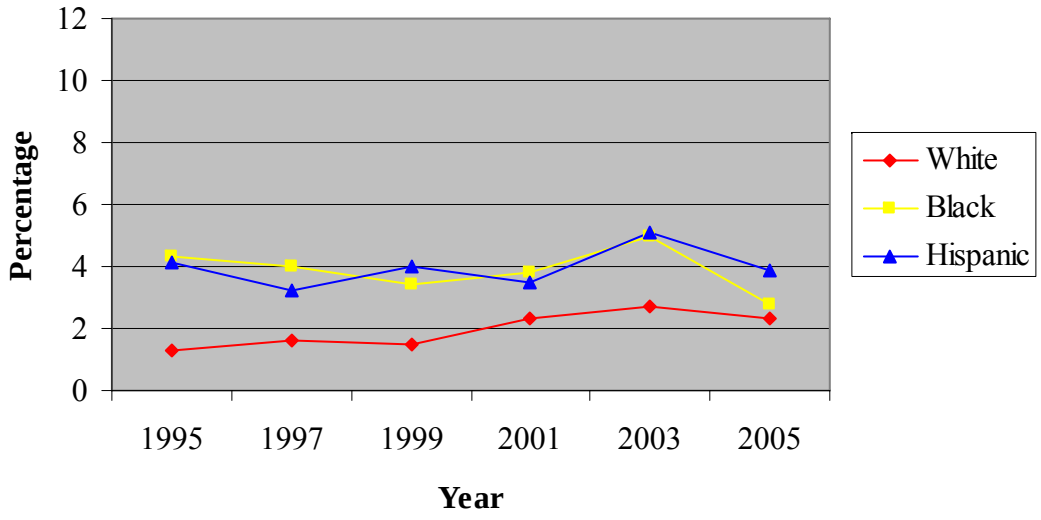

Figure 9. Prevalence of Exercise
Among Male Adolescents by Ethnicity

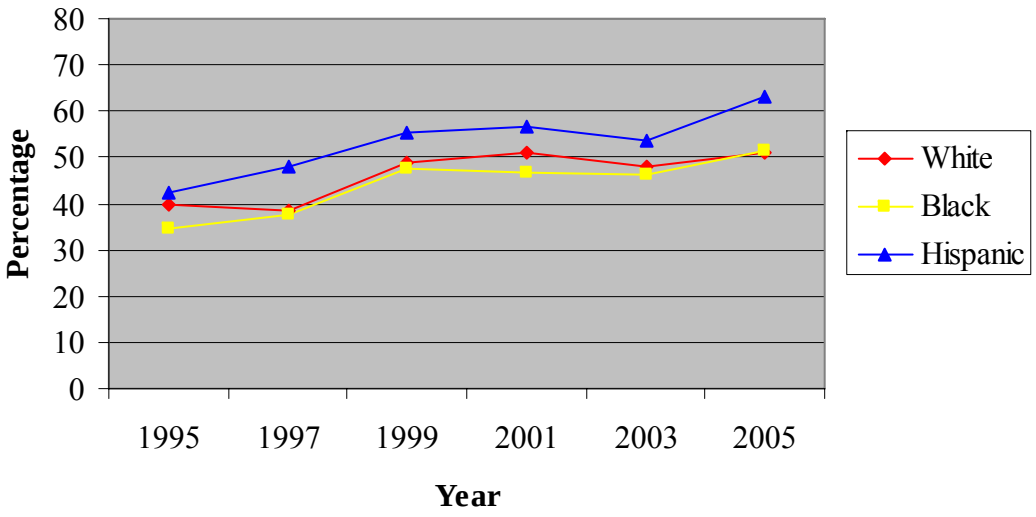
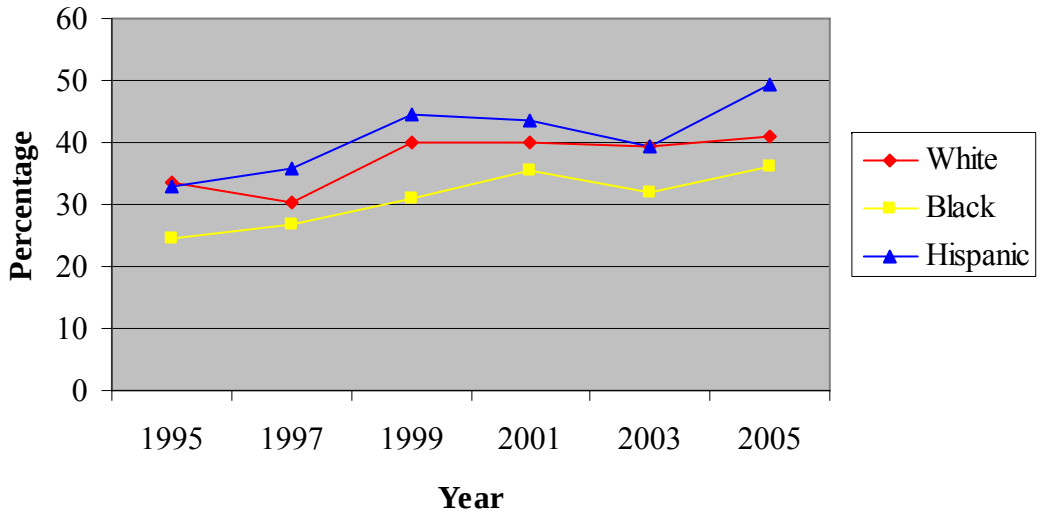
Figure 10. Prevalence of Vigorous Exercise Among Male Adolescents by Ethnicity