Published in final edited form as:
N Engl J Med. 2000 March 23; 342(12): 861–867. doi:10.1056/NEJM200003233421206.

A Prospective Study of Holiday Weight Gain

Jack A. Yanovski, M.D., Ph.D., **Susan Z. Yanovski, M.D.**, **Kara N. Sovik, B.S.**, **Tuc T. Nguyen, M.S.**, **Patrick M. O'Neil, Ph.D.**, and **Nancy G. Sebring, M.Ed., R.D.**
Unit on Growth and Obesity, DEB, NICHD (JAY, KNS, TTN), Division of Digestive Diseases and Nutrition, NIDDK (SZY), NIH Division of Nutrition Research Coordination, NIDDK (KNS), and Nutrition Department, Warren G. Magnuson Clinical Center (NGS), The National Institutes of Health, and Medical University of South Carolina (PMO)

Abstract

Background—It is commonly asserted that the “average American” gains five pounds (2.27 kg) or more over the holiday period between Thanksgiving and New Year's Day, yet few data support this statement.

Methods—To estimate actual holiday-related weight variation, we measured body weight in a non-clinical sample of 195 adults. Subjects were weighed four times, 6-8 weeks apart, such that weight change was determined for three intervals: Pre-Holiday (from late September to mid-November, Holiday (November to January) and Post-Holiday (January to March). A final weight was obtained in 165 participants the following September. Other vital signs and self-reported health measures were obtained to mask the main outcome of interest.

Results—Mean weight increased significantly during the Holiday (+0.37 ± 1.52 kg, $P<0.001$), but not during the Pre-Holiday (+0.18 ± 1.49 kg, $P=0.09$), or Post-Holiday (–0.07 ± 1.14 kg, $P=0.36$) interval. Holiday weight gain was greater than Post-holiday weight gain ($P < 0.002$). Compared with their weight in September, study subjects had an average net weight gain of +0.48 ± 2.22 kg at their March measurement ($P<0.003$). Between March and the next September, there was no significant additional weight change (+0.21 kg ± 2.3 kg, $P=0.13$) for the 165 participants who returned for follow-up.

Conclusions—Average holiday weight gain is 0.37 kg, far less than commonly asserted. As this gain is not reversed during spring or summer months, the net 0.48 kg fall/winter weight gain appears likely to contribute to the increase in body weight that frequently occurs during adulthood.

Keywords

Season; Adiposity; Obesity; Secular Trend; Body Mass Index

Introduction

Overweight and obesity affect approximately one-half of the adult U.S. population,[1, 2] and the proportion of those with obesity, defined as a body mass index (BMI) ≥ 30 kg/m^2 has

Corresponding author: Jack A. Yanovski, M.D., Ph.D., National Institutes of Health, Building 10 Room 10N262, 10 Center Drive MSC 1862, Bethesda, MD 20892-1862, Phone: 301-496-0858, Fax: 301-402-6439, JY15i@NIH.GOV.

increased 50 percent over the past decade.[3] Because obesity, once established, is difficult to reverse, development of effective strategies for prevention is imperative.

Understanding vulnerable times for weight gain throughout the life cycle is an important precursor to development of such strategies. Several time periods, including adolescence,[4,5] pregnancy,[6,7] and mid-life[8] in females, as well as marriage in males[9] appear to be times of particular susceptibility to weight gain. Behavioral or environmental changes, such as smoking cessation,[10,11] or immigration to a more highly urbanized culture,[12,13] can also be associated with weight gain.

For most adults, there is a modest increase in weight observed over time, with the average weight gain in young adults ranging from 0.2-0.8 kg/y.[14-19] The first NHANES follow-up study found that, among adults aged 25-44 y, body weight measured 10 years apart increased on average 3.4 percent in men and 5.2 percent in women.[16,18] A minority gained considerably more: 6.5 percent of the women studied sustained a weight gain of 25 percent or more of their initial body weight over the 10 year observation period.

It is unknown whether the weight gain observed in long-term observational studies of US adults occurs as a result of small, steady increases in weight throughout the year, or because of more discrete periods of increased energy intake or decreased energy expenditure that might occur, for example, over holiday periods or during particular seasons. Few studies have measured individual changes in body weight over more frequent intervals. Two studies reported self-measured body weight in narrowly selected, non-US Caucasian, populations.[20,21] Each found seasonal variations in body weight of less than 0.6 kg. In contrast, studies relying on self-reports have found that healthy individuals believe their weight increases on average by more than 5 pounds (2.27 kg) in the fall or winter.[22,23]

In the US, the winter holiday season is generally considered to begin with Thanksgiving and end after New Year's Day. In the lay press, winter holiday-related weight gain has been the subject of many reports. For example, on December 25, 1995, the Cable News Network reported, "… the average American [will] gain seven to 10 pounds before the New Year…"[24] A report from the Texas Medical Association states: "…most studies show the average American gains 8 pounds during the period from Thanksgiving to New Year's Day."[25] All the reports we retrieved[24-31] suggested that at least 5 pounds are gained from Thanksgiving to New Year's Day, but none offered a credible source for that suggestion. A literature review failed to identify any clinical research findings supporting the claim of a 5 pound or greater average weight gain over the winter season.[20,21,32-35]

In order to determine the effect of both season and the holiday period on change in body weight in US adults, we measured weight in a non-clinical sample of adults from September to March, and calculated individual changes in body weight before, during, and after the winter holiday season. We hypothesized that any observed weight change would be similar during each measurement period.

Methods

Subjects

200 subjects were recruited for a study of “seasonal changes in vital signs” by advertisements placed throughout the NIH campus in Bethesda, MD. Subjects were compensated for participation. Recruitment was stratified to ensure equitable participation of both sexes, several racial/ethnic groups, and a range of ages and occupations (Table 1). Entry criteria included age ≥18 y, good general health, and willingness to attend all study visits. Subjects were excluded if they had significant medical conditions, used medications known to affect body weight, or were pregnant. Subjects were enrolled without regard for weight, dietary habits, or dieting history. The study was approved by the Institutional Review Board of the National Institute of Child Health and Human Development, NIH, and all subjects provided informed written consent before participating.

Protocol

Subjects were seen on four occasions 6-8 weeks apart: during late September or early October, during mid-November (before Thanksgiving), in early- or mid- January (after New Year's Day), and again in late February or early March. Height to the nearest 1 mm was measured at the first visit by stadiometer (Holtain Ltd., Crymmyck, Wales) that was calibrated against a standard height before each use. At each visit, weight was measured to the nearest 0.01 kg with an electronic scale (Life Measurement Instruments, Concord, CA) that was calibrated against a standard weight before each measurement. Subjects were weighed wearing undergarments and hospital gowns without shoes. Each subject was weighed at the same time of day as at the initial visit (e.g., morning, after breakfast, or afternoon, after lunch).

The main outcome of interest (change in body weight) was masked by means of additional measurements carried out at study visits. Temperature was measured electronically (Sherwood Medical, St. Louis, MO) once at each visit, and both pulse and blood pressure were measured twice by automated sphygmomanometer (Critikon, Tampa, FL), first before, and again after, subjects completed a series of questionnaires. These questionnaires included a health screening form and forms evaluating factors such as stress, dietary and activity patterns, and depression, including winter seasonal affective disorder.[22,23] Subjects were asked to describe changes in their habits during the previous 6 weeks at their first visit, and changes since their last visit at all other visits. At their visit in late February or early March, subjects were queried as to their understanding of the main purpose of the research project, and asked how much weight they believed they had gained over the winter holiday period.

Subjects were subsequently invited to return for two additional visits, in June, and in late-September or early-October, in order to observe body weight change over a one year interval.

Statistical Analysis

Data were analyzed on a Macintosh PowerPC using StatView 4.5 (Abacus Concepts, Inc., Berkeley, CA). Weights from the first four measurements were used to compute weight-

NIH-PA Author Manuscript
NIH-PA Author Manuscript

change for three intervals: Pre-Holiday (September to November), Holiday (November to January), and Post-Holiday (January to March). Because there were individual differences in the exact intervals between measurements, data were also analyzed as weight change adjusted for a 6 week time interval by dividing weight change by the number of days between measurements and multiplying by 42. Results were unchanged using this analysis, and the unadjusted weight changes are presented. Weight change between measurements was also calculated for the subset of subjects measured in June and September. Analysis of variance with repeated measures was used to examine both body weight and body weight change, with race and sex tested as independent factors. Post-hoc paired t-tests, with significance adjusted by the Bonferoni correction for multiple comparisons, were used to detect differences in weight and in weight change for each interval. Paired t-tests were also employed to determine differences between observed and self-perceived Holiday weight change. Contingency table analysis was used to determine differences in weight gain among subjects who were non-overweight (BMI <25 kg/m^2), subjects who were overweight (BMI ≥25 but <30 kg/m^2) and subjects who were obese (BMI ≥ 30 kg/m^2). Linear regression was used to determine the relationship between weight change and continuous variables such as age and initial BMI. Data are presented in the text and tables as mean ± SD and in figures as mean ± SEM unless otherwise stated.

Results

Subject demographic data are presented in Table 1. Fifty-one percent of subjects were female. The sample was racially diverse, and age ranged from 19y through 82y. Mean initial BMI (25.9±4.8 kg/m$_2$) and median BMI (24.8 kg/m^2) were similar to the median BMI (25.5 kg/m^2) reported for the adult US population,[1] as was the prevalence of overweight (27 percent of subjects with BMI ≥25 but <30 kg/m^2) and obesity (21 percent with BMI ≥ 30 kg/m^2).[2] Eighty-eight percent of subjects worked on the campus of the National Institutes of Health, a government facility that employs over 19,000 individuals in occupations ranging from maintenance and food service through biomedical research. Subjects were successfully recruited from a variety of occupations. Socioeconomic status, as assessed by the Hollingshead scale, ranged from social classes II through V (Table 1).

Of the 200 recruited subjects, complete data on weight from the first 4 visits were available for 195 (98 percent). Analysis of variance with repeated measures revealed that weight changed significantly during the study (P<0.01). Mean weight increased significantly (Figure 1) during the Holiday interval (+0.37±1.52 kg, range –6.96 to +4.07 kg, P<0.001), but not during the Pre-Holiday (+0.18±1.49 kg, range –4.33 to +8.07 kg, P=0.09), or Post-Holiday (–0.07±1.14 kg, range –6.18 to +2.47 kg, P=0.36) intervals. Weight gain during the Holiday interval was not significantly different from weight change during the Pre-Holiday period (P=0.23), but was greater than in the Post-Holiday interval (P < 0.002). Compared with their weight in September, study subjects had an average net weight gain of +0.48±2.22 kg (1.05 lb) at their March measurement (range –9.33 to +8.02 kg, P<0.003). However, most subjects had no evidence for significant weight change: over 50 percent had body weights that differed by no more than 1 kg at each of the 3 measurements (Figure 2).

Twenty-nine subjects (15 percent) reported attempting weight loss during the Holiday interval, but their Holiday weight change (+0.13 ± 1.73 kg) did not differ from that of subjects who reported no such attempts (+0.42 ± 1.49 kg, P=0.35). There were no independent effects of sex, race, or socioeconomic status on weight change during any interval, and no correlation between weight change and age ($r^2 < 0.001$).

Forty-five percent of subjects were measured within the first week of January, and 86 percent were measured before January 14th. The exact date of weight measurement relative to the start of the new year was not significantly related to weight change (first week +0.55±1.4 kg; second week +0.23±1.49 kg, third week +0.56±1.67 kg; fourth week +0.30±1.77 kg), and there were no differences in the proportion of subjects reporting dieting according to the week of measurement (χ^2, P = 0.74).

Weight change during the Holiday interval was not significantly correlated with BMI ($r^2 < 0.006$). However, there was a trend towards a higher likelihood of a ≥2.27 kg weight gain as weight increased, when subject BMI was categorized as non-overweight, overweight, or obese (Figure 3, P=0.06). Because a weight gain of 2.27 kg corresponded to a 3 percent weight change for individuals with the average body weight in this study (74.4 kg), we also determined whether a ≥3 percent holiday weight gain was more common among overweight or obese subjects. When a major weight gain was defined in this manner, the probability of a ≥3 percent weight gain was not different (P=0.76) among subjects who were non-overweight (7.9 percent), overweight (11.1 percent), or obese (7.5 percent).

Using self-report data, we examined several other possible predictive factors for holiday weight gain: changes in perceived stress, depression, hunger, or activity, changes in smoking habit, the presence of winter seasonal affective disorder, and the number of parties/ receptions attended. Only two factors, reported change in activity (P<0.01) and in hunger (P<0.001) were related to Holiday weight change (Fig 4). Those who reported being much more active or much less hungry since their last visit had the greatest weight loss; conversely, those reporting much less activity or much more hunger since their last visit gained the most over the Holiday interval.

Subjects were asked at their March clinic visit how much weight they believed they gained over the November to January Holiday period. Perceived weight gain (1.57±1.47 kg) was significantly greater than measured weight gain by an average of 1.12±1.79 kg (paired t-test, P<0.0001), with no differences in the degree of overestimation by sex, race, or BMI.

In order to assess the adequacy of the masking procedures, subjects were also asked at their March visit to describe what they believed to be the primary purpose of the study. Only 21.4 percent identified seasonal weight change as the main outcome of interest. The remainder endorsed a variety of primary outcomes, including seasonal changes in psychological factors and/or vital signs such as temperature, pulse or blood pressure, (64.8 percent) or were unsure (13.8 percent). Holiday weight change of those who identified weight as the primary outcome (+0.24±1.52 kg) was not significantly different from those endorsing other primary outcome measures (+0.41±2.33 kg, P=0.53).

A subset of 165 subjects (83 percent) agreed to return for two additional visits: in June and again in late-September or early-October. Subjects completing these additional visits did not differ significantly from those declining to return in initial body weight, body mass index, age, sex, race/ethnicity, or socioeconomic status. Their average Holiday weight change (+0.32±1.52 kg, $p<0.003$), and their net weight change from September to March (+0.40±2.28 kg) were also not significantly different from the weight changes of those not choosing to return. For these 165 subjects, there were no significant changes in body weight between March and June (+0.03±1.91 kg, $P = 0.86$), or between June and the next September (+0.19±1.75 kg, $P = 0.16$). Between March and September, their net weight change was +0.21 kg±2.3 kg ($P=0.13$), leading to a net +0.62±3.03 kg weight gain during the 1 year observation period ($P < 0.01$).

Discussion

In contrast to the common perception that weight increases by ≥2.27 kg over the winter holiday season, the measured weight of the vast majority of subjects in this study changed little between Thanksgiving and New Year's Day. Subjects believed they had gained four times more weight than their actual holiday weight change of 0.37 kg. Fewer than 10 percent of subjects gained ≥2.27 kg, and 55 percent had weights within 1 kg of their other measurements. Thus, despite the fact that more than 85 percent of study subjects made no efforts to control their weight, large weight gains over the winter holiday season were not the norm. Unfortunately, we also found that the 0.18 kg average weight change seen in the fall pre-holiday period, along with the 0.37 kg increase during the holiday season, was largely maintained during the post-holiday winter period from January to March, resulting in a net average weight gain of 0.48 kg. In subjects completing one year of observation, weight increased by 0.32 kg during the Holiday interval, and 0.62 kg over the entire year, suggesting that the period contributing most to yearly weight change is the 6-week Holiday interval.

To the best of our knowledge, our study is the first to evaluate change in weight over the fall and winter in a large non-clinical sample of US adults. A potential limitation of our study is that we used a convenience sample, primarily NIH employees, rather than a population-based sample. Subjects resided in a large, urban area, and individuals from the lowest socioeconomic levels were under-represented compared with the US population. It is also possible that employees of the NIH might be more health conscious than the general population. Although the range of subjects in age, ethnicity, socioeconomic status, and BMI was broad, and both mean body weight and prevalence of overweight and obesity were remarkably reflective of the US adult population, these findings may not be generalizable to all US populations. Retention of the cohort was excellent, with 98 percent of subjects completing the primary study and 82.5 percent returning for weight measurements in June and the next September. Accurate body weights were attained through standardized protocols for weighing, which included similar clothing and time of day. Our attempts to mask the primary study purpose by collecting additional measures appeared to be effective, as only 21 percent concluded that change in body weight was the primary purpose of the study. Masking may have decreased the likelihood of subjects attempting to change their body weight (for example, through dieting or meal skipping) prior to study visits. We believe that our results are likely to reflect more accurately actual winter holiday season weight change than studies that relied on clinical samples or on self-report.

We also found that those who had a major holiday weight gain, defined as ≥ 2.27 kg were more likely to be overweight or obese. Such weight gain may be clinically important, particularly for those who are already at-risk for obesity-related comorbid conditions. A Swedish study of obese subjects in a weight maintenance program and of hospital employees, found that self-recorded Christmas-time weight gain (over a 3 week period) averaged 0.6 kg or less in each group. However, the obese, weight-reduced, patients had significantly greater weight variability, with a maximum weight increase of 6.1 kg, versus 2.2 kg in controls.[21] Others have described lower efficacy of weight reduction or maintenance programs undertaken during the winter season.[35-38] Taken together, these results suggest that the winter holiday season may present special risks for those who are already overweight or obese, and that such individuals may benefit from seasonal weight-gain prevention efforts.[35,38,39] The relationship we found between reported physical activity and weight change point to the need for further studies determining whether increasing physical activity can prevent holiday-related weight gain in at-risk individuals.

Weight gain during adulthood has serious consequences for health, and is a risk factor for the development of type 2 diabetes,[40] cardiovascular disease,[41] and other obesity-related conditions.[42,43] The 0.48 kg September to March weight gain of the subjects in this study might not appear to be clinically relevant, and could easily go unnoticed by both patients and health-care providers. Our data suggest that this weight gain is not reversed during spring or summer months. Therefore, the cumulative effects of yearly fall/winter weight gain are likely to contribute to the significant increase in body weight that frequently occurs during adulthood. Promotion of weight stability during the fall/winter months may prove useful as a strategy to prevent age-related weight gain in the US.

Acknowledgments

J. Yanovski and N. Sebring are Commissioned Officers in the USPHS Supported by Z01 HD-00641 (J.A.Y.)

References

1. Kuczmarski RJ, Carroll MD, Flegal KM, Troiano RP. Varying body mass index cutoff points to describe overweight prevalence among U.S. adults: NHANES III (1988 to 1994). Obes Res. 1997; 5:542–548. [PubMed: 9449138]
2. Flegal KM, Carroll MD, Kuczmarski RJ, Johnson CL. Overweight and obesity in the United States: prevalence and trends, 1960-1994. Int J Obes Relat Metab Disord. 1998; 22:39–47. [PubMed: 9481598]
3. Anon. Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults--The Evidence Report. National Institutes of Health. Obes Res. 1998; 6(Suppl 2): 51S–209S. [PubMed: 9813653]
4. Najjar MF, Rowland M. Anthropometric reference data and prevalence of overweight, United States, 1976-80. Vital Health Stat. 1987; 11:1–73.
5. Serdula MK, Ivery D, Coates RJ, Freedman DS, Williamson DF, Byers T. Do obese children become obese adults? A review of the literature Prev Med. 1993; 22:167–77.

NIH-PA Author Manuscript

NIH-PA Author Manuscript

6. Williamson DF, Madans J, Pamuk E, Flegal KM, Kendrick JS, Serdula MK. A prospective study of childbearing and 10-year weight gain in US white women 25 to 45 years of age. Int J Obes Relat Metab Disord. 1994; 18:561–9. [PubMed: 7951478]
7. Wolfe WS, Sobal J, Olson CM, Frongillo EA Jr, Williamson DF. Parity-associated weight gain and its modification by sociodemographic and behavioral factors: a prospective analysis in US women. Int J Obes Relat Metab Disord. 1997; 21:802–10. [PubMed: 9376894]
8. Wing RR, Matthews KA, Kuller LH, Meilahn EN, Plantinga PL. Weight gain at the time of menopause. Arch Intern Med. 1991; 151:97–102. [PubMed: 1985614]
9. Sobal J, Rauschenbach BS, Frongillo EA Jr. Marital status, fatness and obesity. Soc Sci Med. 1992; 35:915–23. [PubMed: 1411692]
10. Williamson DF, Madans J, Anda RF, Kleinman JC, Giovino GA, Byers T. Smoking cessation and severity of weight gain in a national cohort. N Engl J Med. 1991; 324:739–45. [PubMed: 1997840]
11. Flegal KM, Troiano RP, Pamuk ER, Kuczmarski RJ, Campbell SM. The influence of smoking cessation on the prevalence of overweight in the United States. N Engl J Med. 1995; 333:1165–1170. [PubMed: 7565970]
12. Goldbourt U, Khoury M, Landau E, Reisin LH, Rubinstein A. Blood pressure in Ethiopian immigrants: relationship to age and anthropometric factors, and changes during their first year in Israel. Isr J Med Sci. 1991; 27:264–7. [PubMed: 2050508]
13. Pawson IG, Janes G. Biocultural risks in longevity: Samoans in California. Soc Sci Med. 1982; 16:183–90. [PubMed: 7100969]
14. Rookus MA, Burema J, van't Hof MA, Deurenberg P, van der Wiel-Wetzels WA, Hautvast JG. The development of the body mass index in young adults, I: Age- reference curves based on a four-year mixed-longitudinal study. Hum Biol. 1987; 59:599–615. [PubMed: 3623507]
15. Colditz GA, Willett WC, Stampfer MJ, London SJ, Segal MR, Speizer FE. Patterns of weight change and their relation to diet in a cohort of healthy women. Am J Clin Nutr. 1990; 51:1100–5. [PubMed: 2349925]
16. Williamson DF, Kahn HS, Remington PL, Anda RF. The 10-year incidence of overweight and major weight gain in US adults. Arch Intern Med. 1990; 150:665–72. [PubMed: 2310286]
17. Shah M, Hannan PJ, Jeffery RW. Secular trends in body mass index in the adult population of three communitites from the upper mid-western part of the USA: The Minnesoda Heart Health Program. Int J Obes. 1991; 15:499–503. [PubMed: 1938092]
18. Williamson DF. Descriptive epidemiology of body weight and weight change in U.S. adults. Ann Intern Med. 1993; 119:646–9. [PubMed: 8363190]
19. Jeffery RW, French SA. Preventing weight gain in adults: design, methods and one year results from the Pound of Prevention study. Int J Obes Relat Metab Disord. 1997; 21:457–64. [PubMed: 9192229]
20. Van Staveren WA, Deurenberg P, Burema J, De Groot LC, Hautvast JG. Seasonal variation in food intake, pattern of physical activity and change in body weight in a group of young adult Dutch women consuming self-selected diets. Int J Obes. 1986; 10:133–45. [PubMed: 3013791]
21. Andersson I, Rossner S. The Christmas factor in obesity therapy. Int J Obes Relat Metab Disord. 1992; 16:1013–5. [PubMed: 1335971]
22. Thompson C, Stinson D, Fernandez M, Fine J, Isaacs G. A comparison of normal, bipolar and seasonal affective disorder subjects using the Seasonal Pattern Assessment Questionnaire. J Affect Disord. 1988; 14:257–64. [PubMed: 2968387]
23. Rosenthal NE, Genhart M, Jacobsen FM, Skwerer RG, Wehr TA. Disturbances of appetite and weight regulation in seasonal affective disorder. Ann N Y Acad Sci. 1987; 499:216–30. [PubMed: 3300483]
24. AP. Average American gains 7 to 10 pounds over holidays. CNN Interactive; Gainesville, FL: 1995. http://cnn.com/HEALTH/9512/holiday_weight/
25. Anon. Holiday Eating. Texas Medical Association Internet Site; Austin, TX: 1998. http://www.texmed.org/has/pin/dan/heg1.asp
26. Moe, K. Keeping Holiday Pounds Off!. Virtual Naval Hospital Internet Site; Charleston, SC: 1996. http://www.vnh.org/NHB/HW9647KeepPoundsOff.html

27. Nash, W. Rich holiday food leads to overeating and weight gain. The Michigan Daily; Ann Arbor, MI: 1997. http://www.pub.umich.edu/daily/1997/dec/12-10-97/new/news7.html
28. Carley, T. Exercise tips to reduce holiday weight gain. Slucare News Release; St. Louis, MO: 1997. http://www.slucare.edu/publications/97/weightgain.shtml
29. Anon. Party hearty with the right approach. Ohio University Web Site; Athens, OH: 1997. http://www.ohiou.edu/news/months/DEC97/104.HTML
30. Wescott, W. Survival Strategies For The Holiday Season. HealthWorld Online. 1998. http://www.healthy.net/library/articles/westcott/survival.htm
31. Smith, N. Holiday Weight Gain. North Carolina State University Cooperative Extension Service; Gaston, NC: 1999. http://gaston.ces.state.nc.us/staff/holgain.html
32. Nurse GT. Seasonal fluctuations in the body weight of African villagers. Cent Afr J Med. 1968; 14:122–7. [PubMed: 5671956]
33. Van Liere MJ, Ategbo EA, Hoorweg J, Den Hartog AP, Hautvast JG. The significance of socio-economic characteristics for adult seasonal body-weight fluctuations: a study in north-western Benin. Br J Nutr. 1994; 72:479–88. [PubMed: 7947661]
34. Panter-Brick C. Inter-individual and seasonal weight variation in rural Nepali women. J Biosoc Sci. 1995; 27:215–33. [PubMed: 7738083]
35. Boutelle KN, Kirschenbaum DS, Baker RC, Mitchell ME. How can obese weight controllers minimize weight gain during the high risk holiday season? By self-monitoring very consistently Health Psychol. 1999; 18:364–368.
36. Zahorska-Markiewicz B. Weight reduction and seasonal variation. Int J Obes. 1980; 4:139–43. [PubMed: 7399804]
37. Shimamoto H, Tanaka K, Adachi Y. Seasonal variation may have an effect on body composition alterations induced by exercise training. Japanese Journal of Physical Fitness and Sports Medicine. 1998; 47:509–516.
38. Baker RC, Kirschenbaum DS. Weight control during the holidays: highly consistent self-monitoring as a potentially useful coping mechanism. Health Psychol. 1998; 17:367–70. [PubMed: 9697946]
39. Silverstein LJ, St Jeor ST, Harrington ME, Hayes BI, Simpson MT. Prevention of weight gain through the holidays. J Amer Diet Assoc. 1996; 96:A30.
40. Colditz GA, Willett WC, Stampfer MJ, et al. Weight as a risk factor for clinical diabetes in women. Am J Epidemiol. 1990; 132:501–13. [PubMed: 2389754]
41. Manson JE, Colditz GA, Stampfer MJ, et al. A prospective study of obesity and risk of coronary heart disease in women. N Engl J Med. 1990; 322:882–9. [PubMed: 2314422]
42. Ballard-Barbash R, Schatzkin A, Taylor PR, Kahle LL. Association of change in body mass with breast cancer. Cancer Res. 1990; 50:2152–5. [PubMed: 2317807]
43. Sahyoun NR, Hochberg MC, Helmick CG, Harris T, Pamuk ER. Body mass index, weight change, and incidence of self-reported physician-diagnosed arthritis among women. Am J Public Health. 1999; 89:391–4. [PubMed: 10076492]

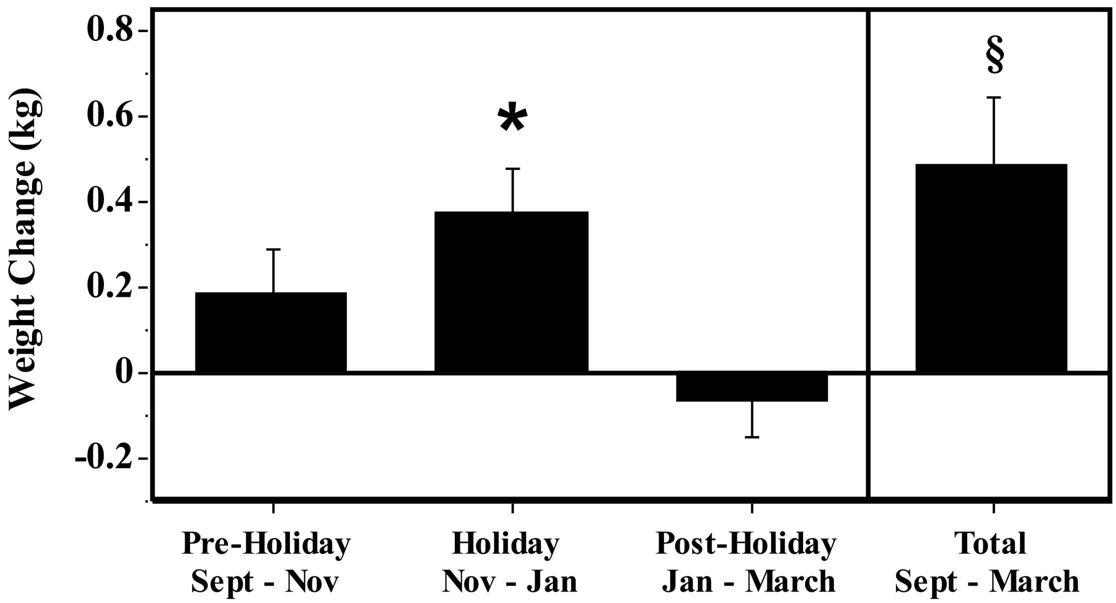

Figure 1.

Weight change in 195 subjects. Pre-holiday: interval from late September or early October, through mid-November (before Thanksgiving); Holiday: winter holiday interval from mid-November through early January (after New Year's Day); Post-holiday: interval from early January through late February or early March; Total: interval from first measurement in late September or early October through last measurement in late February or early March. *P<0.001, weight increase during the Holiday interval and P<0.002, Holiday vs. Post-Holiday interval. §P<0.003 weight increase over total measurement period from September through March.

NIH-PA Author Manuscript
NIH-PA Author Manuscript

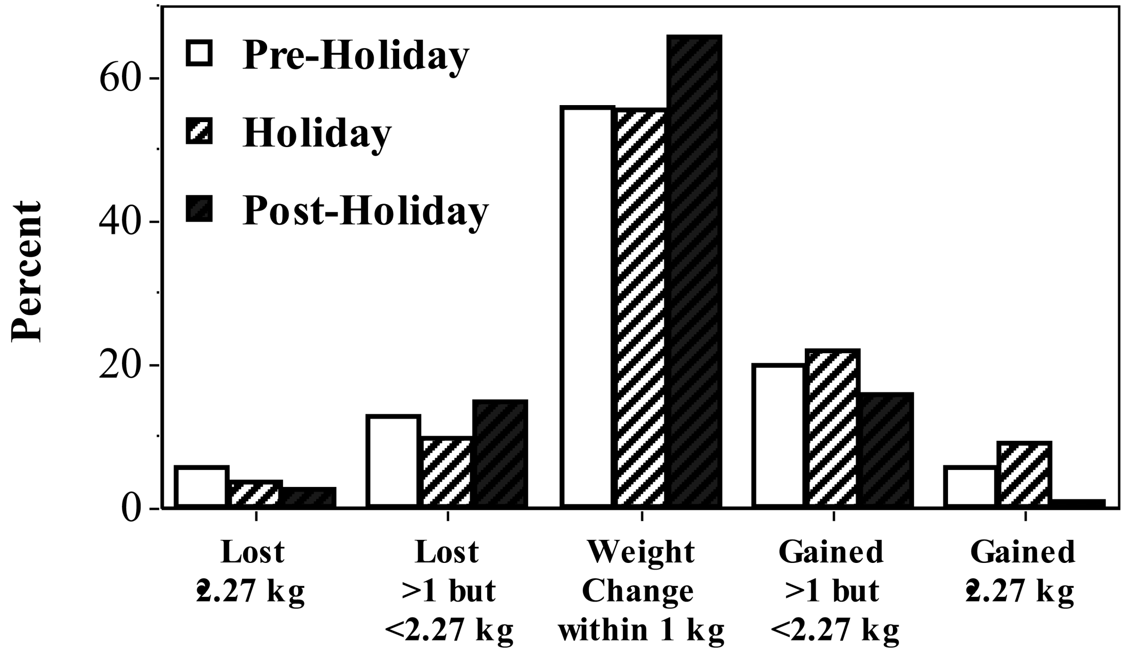

Figure 2.
Distribution of weight change. Over 50 percent of subjects had body weights that differed by no more than 1 kg at each of the 3 measurements.

NIH-PA Author Manuscript
NIH-PA Author Manuscript

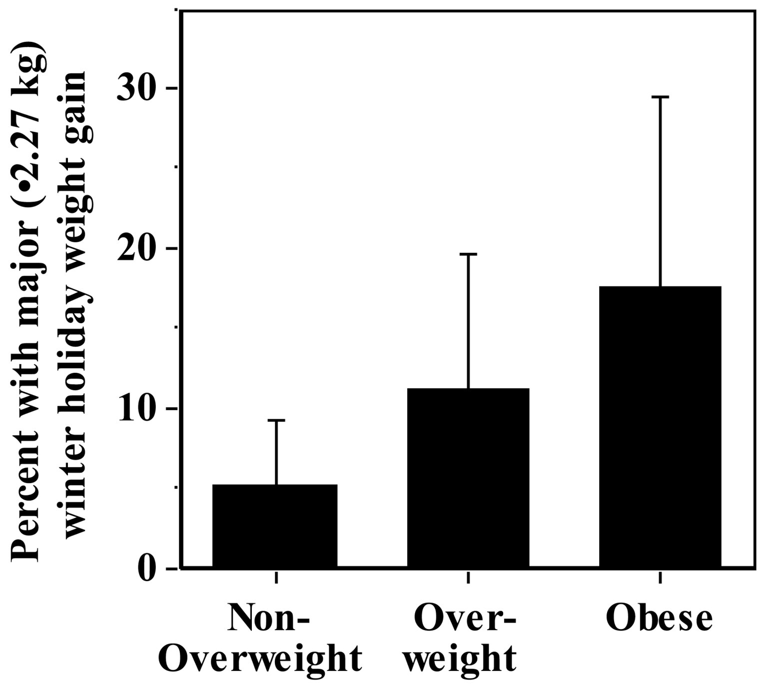

Figure 3.

Percent of subjects with major holiday weight gain, defined as ≥ 2.27 kg in 101 non-overweight (body mass index < 25 kg/m^2), 54 overweight (body mass index ≥ 25 but < 30 kg/m^2), and 40 obese (body mass index ≥ 30 kg/m^2) subjects. 95 percent upper confidence interval is shown. There was a trend for a greater percentage of subjects to have a major holiday weight gain with increasing degree of overweight (P=0.06).

NIH-PA Author Manuscript

NIH-PA Author Manuscript

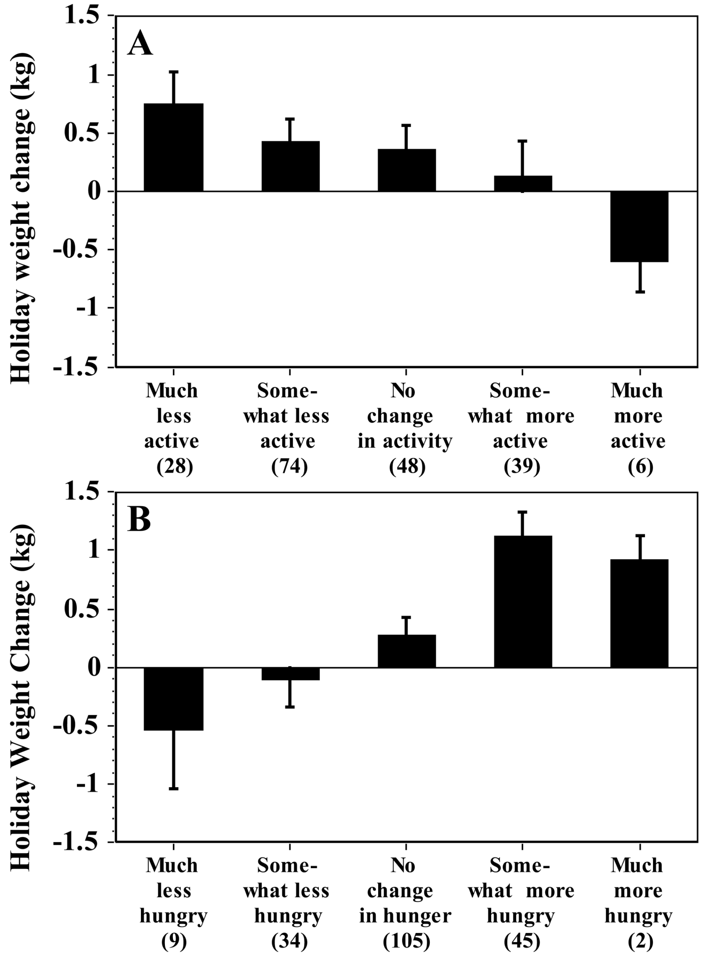

Figure 4.

Self-reported changes in activity (A, $P < 0.01$) and in hunger (B, $P < 0.001$) were significantly related to weight change during the Holiday interval. Group sizes are given in parentheses for each category heading.

Table 1

Demographics

Age	Mean ± SD (y)	39.3 ± 12.4
	Range (y)	19 – 82
Sex	Male (%)	49
	Female (%)	51
Race/Ethnicity	African American (%)	17
	Asian (%)	10
	Caucasian (%)	67
	Hispanic (%)	6
Initial Weight	Mean ± SD (kg)	74.4 ± 16.3
	Range (kg)	43.4 – 139.2
Initial Body	Mean ± SD (kg/m^2)	25.9 ± 4.8
Mass Index (BMI)	Range (kg/m^2)	17.8 - 46.8
	BMI < 25 kg/m^2 (%)	52
	BMI ≥ 25 - < 30 (kg/m^2 (%)	27
	BMI ≥ 30 kg/m^2 (%)	21
Hollingshead Scale of	Median	IV
Socioeconomic Status	Range	II - V
Number of Holiday	Mean ± SD	4.4 ± 2.8 parties
Parties attended	Range	0-10 parties