Objectives: To examine relationships between gender, ethnicity, and residency, with factors influencing weight gain in 756 multiethnic college freshmen. Methods: An online survey obtained participants’ height and weight; consumption of fruits, vegetables, dairy, and meals; dietary and exercise patterns. Results: Ten percent of Asians were underweight; most lived off campus. Forty percent of Hispanics were overweight/obese; most lived on campus. After starting college, on-campus students decreased intake of fruits, vegetables, dairy products, and meal frequency; off-campus students decreased dairy and dinner frequency (P<0.001). Few met dietary guidelines. Conclusions: Moving to campus may contribute to weight gain in some ethnic groups.

Key words: freshman weight gain, residence, ethnicity

Healthy Campus 2010’s goals for body weight will not be achieved. Twenty-two percent of college students reported being overweight [body mass index (BMI) 25-29.9], and 10% reported being obese (BMI > 30). Overweight and obesity in late adolescence strongly predict obesity later in life, increases risk of chronic physical and mental health conditions, have been linked to decreased academic performance, and are expensive to treat. Thus, understanding factors contributing to weight gain in college students is needed to address these issues.

Maintaining energy balance is easier when diets are high in nutrient-dense foods such as fruits and vegetables, whole grains, and dairy products and low in energy-dense foods. Healthy Campus 2010’s nutrition goals thus include increasing the number of college students who consume > 5 daily servings of fruit and vegetables and who consume > 3 daily servings of dairy products (to meet dietary guidelines for calcium). Many college students do not have healthful diets, making these goals elusive. Until these dietary issues are addressed, obesity will remain a difficult problem to solve.

Most studies examining weight gain and food-intake patterns in college students focus on freshman year, considered critical as marking the transition from living at home to living away from home. The popular media suggest that freshmen gain approximately 15 pounds (the “Freshman 15”), despite research indicating most gain only 1 to 6 pounds. Even this small weight gain may be significant, however, if it persists over 4 years. Research focusing on white females living on campus identified factors associated with weight gain, including all-you-can-eat dining halls, snacking, consumption of high-fat “junk food,”
consumption of fewer fruits and vegetables, recent dietary habits, decreased physical activity, and alcohol intake. Pliner and Saunders suggest weight gain may be due to physical relocation rather than starting college, per se. Few studies have examined the effects of gender or residence on freshman weight gain and dietary patterns, and none have examined weight change in multiethnic populations. Currently, 46% of college students are male, and 43% of all students attending 2- and 4-year institutions live with their parents or other relatives. The college population is increasing in ethnic diversity, and Asians now constitute the largest ethnic group on campus. The foregoing makes it important to examine the effects of gender, residence, and ethnicity on dietary and exercise patterns that may affect weight gain, to develop effective, targeted prevention programs.

San José State University is a large public institution with no ethnic majority. Over 50% of freshmen live at home and commute to school. This population presented a unique opportunity to examine the effects of gender, residence, and ethnicity on freshman weight gain and dietary habits in the first semester. This study, therefore, aimed to determine (1) the changes in food intake, meal patterns, and exercise habits for incoming freshmen; (2) if the foregoing changes were a function of gender and whether they were also associated with a change in location (residence) or ethnicity; and (3) if BMI was associated with gender, residence or ethnicity, or with any measured change in dietary or exercise habits.

**METHODS**

**Subject Recruitment**

The San José State University Institutional Review Board for human subjects approved this research. All freshmen (N = 3260) with e-mail addresses attending San José State were eligible to participate in the “Freshman Eating Habits” survey. During early November 2007, all freshmen received 2 e-mail invitations to participate; one was sent from SurveyMonkey.com (www.SurveyMonkey.com, Portland, OR), and the other through the university messaging system. In addition, all students living on campus (n = 1552) received a letter through intercampus mail, and 45% (n = 775) of the 1708 students living off campus received a letter via the US Postal Service. All letters and e-mails mentioned the study was part of the Healthy Campus Initiative and directed students to an online survey, which required informed consent prior to loading. Nonresponders received a follow-up e-mail via SurveyMonkey 2 weeks later. Participants who completed surveys were entered into a drawing for 1 of 10 gift certificates ($25.00 each) for use at the bookstore or on-campus eateries.

**Survey Design, Measures, and Analysis**

The survey, developed specifically for this research, evaluated predictors of weight change previously identified in the literature. It was pretested for content validity, face validity, and readability by a diverse group of nutrition students attending the same university. The survey collected demographic information on gender, residence, and ethnicity. The question “How would you best describe your ethnicity?” resulted in over 20 different responses. For analysis, responses were compressed into the 4 largest categories: Asian, white, Hispanic (primarily Mexican American), and “others,” which represented all other ethnic groups, including African Americans. This distribution mirrors US college enrollment rates.

Self-reported weight and height were used to calculate body mass index (BMI) [(weight in pounds x .703)/(height in inches²)]. This is a common practice with reasonable accuracy in this population. BMI was used as a continuous variable and a categorical variable, based on the Centers for Disease Control and Prevention’s classifications of underweight, normal weight, overweight, and obese. Students were asked how they would best describe their body weight given the choices “underweight,” “just the right weight,” and “overweight” and if they felt their weight had changed more than 5 pounds since starting college. They were also asked about current dieting and past dieting history.

Because intake of fruits, vegetables, and dairy products has been associated with changes in body weight, this survey specifically assessed typical current and past intake of these foods using a detailed food frequency questionnaire.
that sought to capture daily consumption of all fruits, including fresh, frozen, and dried, as well as those found in beverages (such as Jamba Juice, which is available on campus); all vegetables, excluding potatoes, but including all fresh vegetables, as well as those in beverages, soups, and mixed dishes; and all dairy products (including milk, yogurt, cheese, ice cream, and pudding). To accurately determine intake, students were given a list of foods in each category and their associated serving sizes (as defined by MyPyramid.gov) and were asked to identify how many servings of each food they consumed on a daily basis. Choices ranged from “none” to “4 or more.” Two questions assessed fruit intake, and 2 questions assessed vegetable intake. A value for the total number of daily servings of fruits and vegetables was calculated by summing responses to these 4 questions, resulting in a total daily intake that ranged from 0 to 12. These are the same values used in the National College Health Risk Behavior Survey.

Because skipping breakfast has been associated with weight gain in adolescents, students were asked about current and past frequency of meal intake. Choices ranged from “never” to “1-3 times/week,” “4-6 times/week,” and “7 days/week.” Responses were ordinalized from 0 to 3, and past intake was compared to current intake using paired sample t-tests. Students were also asked whether they thought their dietary habits changed since starting college and, if so, whether they thought they were better or worse.

Questions examining exercise habits requested information about current daily participation (duration and frequency) in moderate and vigorous exercise (as defined by MyPyramid.gov). Total frequency (days/week) of moderate and vigorous exercise was summed and then multiplied by duration to give total minutes of each type of exercise. Total minutes of weekly exercise were calculated by adding total minutes of moderate and vigorous exercise. Students were asked whether their exercise routines had changed since starting college.

For data analysis, SPSS for Macintosh version 16.0 (SPSS, Inc, Chicago, IL) was used. Descriptive statistics were used to describe overall sample characteristics. Chi-square tests determined differences for categorical variables. For continuous variables, paired sample t-tests determined differences within groups, and independent sample t-tests determined differences between groups. Pearson’s correlation assessed possible relationships between BMI and current food group intake; breakfast intake; and minutes of moderate, vigorous, and total exercise. Results are presented as mean ± SD. Significance was set at P < 0.05.

**RESULTS**

**Demographics**

The final sample (n = 756, 23% response rate) included all students who provided information about gender, residence, and ethnicity. Demographic information for freshmen entering San José State University provided by the registrar confirmed this sample was representative of the freshman class. Of respondents, 54% lived on campus and 46% lived at home (Table 1). Gender distribution was identical in the 2 residence groups. There was a significant difference in residence based on ethnicity, $\chi^2 (3, N = 756) = 33.61, P < 0.001$; more Asians (46%) lived off campus, and more whites (36%) lived on campus. BMI category distribution was not different based on residence. Most (67%, n = 508) students had desirable BMIs (23.3 ± 4.3, range 15.5 - 45.7); 18% (n = 138) were overweight and 7% (n = 55) were obese.

A closer look at the distribution of BMI categories reveals a significant difference between gender and BMI categories, $\chi^2 (3, N = 756) = 8.34, P = .039$. Sixty-seven percent of all underweight respondents were females, and more (56%) lived off compared to on campus (43%). Fifty-six percent of all obese respondents were males, and more (58%) lived on compared to off campus. Overweight respondents were 60% female. More overweight females lived on campus, but more overweight males lived off campus. There was also a significant difference between ethnicity and BMI categories, $\chi^2 (9, N = 756) = 28.22, P = .001$. Over 70% of white and Asian respondents were normal weight, compared to only 63% of “others” and 56% of Hispanics. More Asians (10%) reported being underweight compared to other groups; of these, 74% lived off campus and 80% were female. Asians also reported the lowest rates of overweight and obesity (19%), followed by whites (22%), “others” (32%), and Hispanics (51%). Fifty-
eight percent of overweight and obese Hispanics lived on campus, and the majority of them were female.

**Change in Food Group Intake**

Table 3 shows changes in food group intake based on residence. Intake of dairy products significantly decreased in on-campus \[ t(391) = -10.19, P < 0.001 \] and off-campus groups \[ t(328) = -3.79, P < 0.001 \] after starting college. Intake of fruits and vegetables significantly decreased in the
on-campus group, t(388) = -10.18, P < 0.001. There were no significant effects due to gender or ethnicity on changes in food group intake.

Diet quality was assessed by comparing intake of fruits and vegetables to the recommended intake of $\geq 5$ servings/day and intake of dairy products to the recommended intake of 3 servings/day.11 Prior to coming to college, few students met the recommended intake for dairy products (Table 4). This number dropped significantly in both on- and off-campus groups, with fewer than 20% currently meeting the requirement. More students met the recommended intake for fruits and vegetables, but current intake was still below recommended levels for over half of those who lived on campus. The percentage of off-campus students meeting the requirement was higher and did not change as a result of starting college. There was no effect of gender or ethnicity on this variable.

### Change in Meal Frequencies

Evaluation of frequency of meal consumption indicates on-campus students decreased frequency of breakfast and lunch consumption [$t(362) = -13.59, P < 0.001$ and $t(363) = -6.97, P < 0.001$, breakfast and lunch, respectively], whereas both on- and off-campus groups consumed dinner significantly less often [$t(362) = -8.53, P < 0.001$ and $t(304) = -3.55, P < 0.001$, on- and off campus, respectively] (Table 5). Frequency of current breakfast consumption was significantly lower in on- compared to off-campus students, $\chi^2(3, N=678) =10.02, P < 0.001$. Of those who

#### Table 3
Change in Food Group Intake Based on Residence

<table>
<thead>
<tr>
<th>Food Group</th>
<th>On Campus (n = 407)</th>
<th>Off Campus (n = 351)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Past</td>
<td>Current</td>
</tr>
<tr>
<td>Dairy</td>
<td>1.9 ± 1.0*</td>
<td>1.5 ± 0.9</td>
</tr>
<tr>
<td>Fruits and vegetables</td>
<td>6.3 ± 2.9*</td>
<td>4.7 ± 2.6</td>
</tr>
</tbody>
</table>

Note.
Food groups are indicated as servings/day, with serving sizes based on MyPyramid.gov.
* Denotes a significant difference between past and current intake within groups, based on paired-sample t tests, $P < 0.001$.

#### Table 4
Change in Number and Percentage of Freshmen Meeting Daily Recommendations for Food Groups Based on Residence

<table>
<thead>
<tr>
<th>Food Group</th>
<th>On Campus</th>
<th>Off Campus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Past</td>
<td>Current</td>
</tr>
<tr>
<td>Dairy</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>145*</td>
<td>37</td>
</tr>
<tr>
<td>Fruits and vegetables</td>
<td>278*</td>
<td>71</td>
</tr>
</tbody>
</table>

Note.
The recommended intake for dairy is 3 servings a day.
The recommended intake for fruits and vegetables is $\geq 5$ servings a day.
* Denotes a significant difference between past and current intake within groups, based on paired-sample t tests, $P < 0.001$.
skipped breakfast, 81% (n =152) lived on campus, compared to 19% (n = 35) who lived off campus. Of those who ate breakfast daily, 72% (n = 94) lived off campus, compared to 28% (n = 36) who lived on campus, a decrease of 97 students in the on-campus group. The only significant effect of gender was for current dinner intake, $\chi^2 (3, N= 679) = 13.57, P = 0.004$, primarily because males consumed dinner more frequently than females did.

In the on-campus group, current intake of breakfast, $\chi^2 (9, N = 368) = 22.25, P = 0.007$ and current intake of dinner, $\chi^2 (9, N = 369) = 39.03, P < 0.001$ were significantly related to ethnicity. Of those living on campus who ate breakfast daily, 47% were whites, compared to 31% of “others,” 17% of Hispanics, and 5% of Asians. Dinner intake was consumed daily by more whites (41%) compared to Asians, “others” and Hispanics (29%, 19%, 11%, respectively). Dinner was skipped daily by almost 7% of Hispanics, and 21% skipped it 4 to 6 times per week. No one else living on campus skipped dinner daily, but 13% of “others,” 7% of whites, and 5% of Asians skipped it 4 to 6 times per week.

**Exercise**

There was no difference in current exercise patterns (minutes of moderate, vigorous, or total exercise minutes/week) based on residence. On-campus students reported 361 ± 448 minutes of total exercise/week, compared to off-campus students, who reported 306 ± 447 minutes/week, translating into ~5 to 6 hours/week. This high level of exercise was attributed to frequent walking, likely due, in part, to prohibition of cars on this urban campus. Males reported significantly more total exercise compared to females (446 ± 526 minutes/week compared to 264 ± 372, males versus females, respectively), $t(590)= 4.94, P < 0.001$. There was no effect of ethnicity on exercise.

Fifty-one percent of all students reported exercising less since starting college; only 23% reported exercising more. Perception of change in exercise was significant based on residence, $\chi^2 (2, N = 644) = 6.71, P = 0.035$. More off- (31%) compared to on-campus students (22%) reported no change in exercise, and 54% of off- compared to 48% of off-campus students reported exercising less. Change in exercise was not related to gender or ethnicity.

**Description of Body Weight, Dieting Behavior, and Perception of Change in Body Weight and Overall Diet**

Description of body weight was highly related to calculated BMI categories in both on- $\chi^2 (6, N = 405) = 191.9, P < 0.001$ and off-campus students $\chi^2 (6, N = 350) = 205.0, P < 0.001]$. Nine percent of students described themselves as underweight, and 7% were classified as such; 57% described themselves as “the right weight,” and 67% were classified as such; and 33% described themselves as overweight, and 26% were classified as either overweight or obese. Students’ description of body weight was not related to

| Table 5 |

<table>
<thead>
<tr>
<th>Change in Meal Frequency Based on Residence</th>
</tr>
</thead>
<tbody>
<tr>
<td>On Campus</td>
</tr>
<tr>
<td>Past</td>
</tr>
<tr>
<td><strong>Meal</strong></td>
</tr>
<tr>
<td>Breakfast</td>
</tr>
<tr>
<td>Lunch</td>
</tr>
<tr>
<td>Dinner</td>
</tr>
</tbody>
</table>

* Denotes a significant difference between past and current intake, within groups, using paired-sample t tests, $P < 0.001$.

a Denotes a significant difference between off- and on-campus groups using independent-sample t tests, $P < 0.001$. 

Note. Responses were coded: 0 = Never; 1 = 1 - 3 times/week; 2 = 4 - 6 times/week and 3 = daily.

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residence, but it was significantly related to gender, $\chi^2 (2, N = 755) = 20.33, P < 0.001$ and ethnicity, $\chi^2 (6, 755) = 21.11, P = 0.002$. Of those who described themselves as underweight, 61% were male; of those who described themselves as overweight, 69% were female. Fourteen percent of all males described themselves as underweight, compared to 6% of females; 38% of all females described themselves as overweight, compared to 27% of males. Of those describing themselves as underweight, the majority (49%) were Asians. Almost half (48%) of all Hispanics described themselves as overweight.

There was a significant relationship between dieting behavior and BMI categories, $\chi^2 (9, N = 755) = 59.98, P < 0.001$, and between dieting behavior and gender, $\chi^2 (3, N = 755) = 35.43, P < 0.001$. Over 50% of all overweight and obese students were either currently on a diet or had been on a diet within the past 1 to 3 years. In contrast, 70% of normal weight and 91% of underweight students had never been on a diet. Of those currently on a diet, 48% were overweight or obese; all but one of the remaining students was normal weight. There was no effect of ethnicity or residence on dieting behavior.

Student perception of weight change since starting college was significantly related to residence, $\chi^2 (2, N = 755) = 25.82, P < 0.001$ with 36% of on-campus students reporting weight gain of at least 5 pounds. Over two thirds (67%) of off-campus students reported no change in weight, compared to 46% of on-campus students. Perception of weight change was related to gender, $\chi^2 (2, N = 755) = 12.73, P = 0.002$. Most (68%) on-campus students who reported weight gain were female. There was no effect of ethnicity on perception of weight gain.

Significantly more on-campus students believed their diet had changed since starting college, $\chi^2 (2, N = 659) = 90.99, P < 0.001; 66%$ of on-campus students reported their diet had worsened, whereas 54% of off-campus students reported their diet had stayed the same. Change was not related to gender or ethnicity. Of the self-described overweight, on-campus students (n = 123), 72% believed their diet had worsened since starting college, and 49% reported weight gain. Of the self-described overweight, off-campus students (n = 87), 38% believed their diet had worsened, and 37% reported weight gain.

Correlation analysis revealed no relationships between current BMI and current intake of fruits and vegetables, dairy products, and breakfast or between BMI and total minutes of exercise.

**DISCUSSION**

This study is the first to closely examine the effect of gender, residence, and ethnicity on changes in dietary patterns and current exercise habits that may predict weight change in first-semester freshmen attending a large urban university. Prior research examining freshman weight gain focused on white females who lived on campus, preventing results to be generalized to an ethnically diverse group of freshmen and to students who live at home, who may have different food and exercise habits from their white and on-campus cohorts. Examining differences based on these variables is important when creating programs aimed at preventing weight gain and supporting healthful eating in the vulnerable freshman population.

Overall, 25% of respondents in this study were classified as overweight or obese (BMI ≥ 25), based on self-report. This is significantly less than the 32% reported by the American College Health Association-National College Health Association (ACHA-NCHA) survey, which also assessed BMI by self-report, a disparity likely caused by demographic differences in the samples. Although the ACHA-NCHA sample was 76% white, 10% Asian, and 8% Hispanic, the instant sample was 36% Asian, 29% white, 16% Hispanic, and 19% “other.” Ten percent of Asian participants were underweight, and most of them lived off campus, whereas 40% of Hispanic participants were overweight or obese, and the majority lived on campus. These results alone demonstrate striking differences from prior surveys for non-diverse college populations.

Moreover, though Asians typically have lower BMIs, they also have higher body fat percentages, putting them at greater risk for type 2 diabetes and cardiovascular disease at lower BMIs. In addition, overweight and obesity rates are highest in Mexican American youth ages 12 to 19, compared to non-Hispanic whites and blacks. Thus, it is important to address students of diverse ethnicities and residence status when designing college programs.
BMI and Dietary Habits

weight-gain prevention programs.

Our sample of 295 males (39%) also provided the opportunity to examine gender effects on BMI and dietary change. Of the 4 prior studies that included males, all had smaller sample sizes, and only one reported that males gained more weight compared to females. In our study, more females compared to males believed they gained at least 5 pounds since starting college, and 56% of all obese respondents were males. Given that males between the ages of 11 and 19 track about 2 percentage points above females for overweight and obesity and that the ACHA-NCHA sample was only 30% male, the true prevalence of obesity in college students may be underestimated. Though males appear to have more weight-protective behaviors than females (such as exercising more and consuming dinner more frequently), this study points to the importance of including a large number of males in studies examining freshman weight gain and making sure males are targeted in weight-prevention programs.

It has been postulated that students who live on campus, with access to all-you-can-eat dining facilities, are at greater risk of weight gain. Yet, few studies have examined the effect of residence on change in freshman food habits, exercise, and body weight. In 2 studies, ≤ 5% of the sample lived off campus; another used a matched community sample; and in the last, the only effect of residence on body weight was in restrained eaters. The current study is the first to include a large group (N = 351) of ethnically diverse students living at home with their parents, whose food environment and meal patterns are likely to be quite different from those whose environments have changed dramatically by moving on campus. This study reports no effect of residence on BMI distribution, but does report a significant effect of residence on change in fruit and vegetable intake. After starting college, 25% fewer on-campus students met the daily requirement, whereas the percentage of off-campus students who met the requirement stayed the same. Some studies have reported that freshmen decrease intake of fruits and vegetables, whereas others report that intake stays the same. Regardless, all are in agreement that most freshmen fail to meet the recommended intake. In contrast to Pliner and Saunders, this study was unable to show a relationship between fruit and vegetable intake and BMI. However, these low-calorie, high-nutrient-density foods are part of a well-balanced diet, and their consumption should be encouraged.

This study also reports all students showed a significant drop in dairy intake, with ≤ 20% meeting the requirement after starting college. This is important because peak bone density, a predictor for osteoporosis later in life, is not achieved until 25 to 30 years of age. Combined with research indicating many college students fail to meet daily requirements for dairy products, these data emphasize the need for increased education, availability, and access to dairy products, especially for students living on campus. Although research has examined the link between dairy consumption and body weight, we found no such relationship in this sample, not surprising due to the overall low dairy intake.

Meal frequency significantly decreased in students who lived on campus. Breakfast consumption showed the most dramatic decline; only 28% of on-campus students ate breakfast daily. On-campus students may stay up late and sleep through breakfast, whereas off-campus students who commute to school may get up earlier and eat breakfast before they leave for school. Skipping breakfast predicted an increased BMI in 2 large studies. Notably, this study indicated skipping meals, especially breakfast, was most marked in Hispanics, a group for whom skipping breakfast was previously reported to cause increased visceral fat in those already overweight. Though this study failed to show any relationship between meal frequency and BMI, it is possible that skipping meals resulted in increased snacking, a behavior (though not measured in this study) previously linked to freshman weight gain.

This study reported that residence had no effect on current exercise patterns, but more on-campus students reported exercising less since starting college. This supports Butler et al. who reported all forms of physical activity decreased significantly in freshmen living on campus. Studies examining the effect of exercise on freshman weight gain are limited. One reported that freshman weight gain was associated with increased
exercise, and 2 agreed with this study in reporting no effect of exercise on BMI or weight change. In this study, participants also reported fairly high levels (5 to 6 hours/week) of physical activity, leading one to conclude that dietary factors play a more important role in weight change than physical activity.

Finally, more on-campus students reported their body weight and diet had changed since starting college. Almost 75% of those self-described as overweight reported their diet worsened, and almost 50% reported weight gain. This is not surprising, considering living on campus provides freshman with many new dining options, easy accessibility to “junk food,” and independence to make their own food choices. In addition, the majority of overweight and obese students reported current or past dieting behavior, a practice related to weight gain in freshmen.

There is no clear relationship between dieting behavior, change in dietary habits, and change in weight gain in this population, especially because there was no difference based on residence. It would be interesting to examine whether the worsening of dietary habits leading to weight gain is what leads to dieting or whether it is the fact that dieting and skipping meals leads to poor dietary habits that actually causes the weight gain.

**Limitations**

This study had a number of potential limitations. First, it used an unvalidated food frequency questionnaire, which is subject to recall and respondent bias. Previous studies have assessed food intake using different tools. Two groups developed their own tools. Kasparek et al used the Block Food Frequency Rapid Screener, which provides a quick estimate of frequency of intake, but fails to account for portion size and has a maximum response rate of 1+/day for all categories. Unlike our questionnaire, the Rapid Screener may underestimate intake if more than 2 pieces of fresh fruit and/or vegetables are consumed daily, a possibility in a California university. Standardization of methods to assess food intake in this population is warranted.

Second, the present study used self-reported height and weight for BMI assessment and excluded those who failed to report these measures, such as obese students, who might be underrepresented.

Use of self-reported height and weight is common for studying college students and has shown a high correlation with actual weight. Although there were lower percentages of overweight and obese respondents compared to ACHA-NCHA data, this was likely due to ethnic differences in 2 populations.

Third, the current study identified the survey as the “Freshman Eating Habits” survey and provided an incentive, which may have caused selection bias. Reducing that bias was a large sample (N = 776), similarities in BMI based on residence, the relatively high percentage of male respondents (39%), and an ethnic distribution that mirrored the freshman class at this university.

Fourth, this study failed to examine other dietary components that may affect body weight in this population such as increased snacking on high-fat foods and alcohol intake, although the relationship between these components has not always been associated with increased weight. Finally, this study failed to assess body weight prior to attending college and therefore relied on student perception of body weight change. Kasparek et al also assessed weight change in freshmen over time by asking, “How much do you think your weight changed?” and only one study surveyed students accepted into a small private Ivy League college during spring of their senior year in high school.

**CONCLUSIONS**

Research examining freshman weight gain has focused on white females living on campus. As such, the prior studies ignored possible gender and ethnicity differences and failed to determine whether it is the starting of college or the move to college that is more responsible for weight gain. This study examined the effect of gender, residence, and ethnicity on diet and exercise habits previously reported to contribute to weight gain in this population. It calls out the importance of targeting males living on campus with weight-gain prevention and supports efforts to promote physical activity in females. It reports students living on campus significantly decreased intake of healthful foods and of meals. It also reports more overweight freshmen living on campus reported that their diet worsened and that they gained weight, compared to fresh-
men living at home. This suggests the move to college, rather than the starting of college, is an important variable contributing to weight gain. Future studies should identify factors associated with on-campus living that may contribute to weight gain. Also, longer studies are needed to determine if the changes for incoming freshmen are maintained over time, especially in students who live at home for ≥ 4 years or who move from living on campus to off campus after their freshman year.

Because there were significant differences in ethnicity between students living on and off campus, but no such differences for BMI distribution and gender, further research is needed to examine the contribution of ethnicity to changes in habits that may contribute to weight change in a multiethnic population. For example, it is important to determine barriers to breakfast intake in Hispanic students and to realize that a normal BMI may underestimate health risk in Asian students. Interventions aimed at weight-gain prevention and alternate ways to assess health risk are needed. Despite unanswered questions, it is clear many college students, regardless of gender, residence, or ethnicity, fail to meet guidelines for healthful eating and healthful body weight, which may have long-term ramifications on their health and productivity. Efforts to increase fruit, vegetable, and dairy intake are needed; and programs and environments to support these dietary changes are important to ensure healthy students and a healthy workforce.

Acknowledgments
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