Performance of a Short Percentage Energy from Fat Tool in Measuring Change in Dietary Intervention Studies


Abstract
Measurement of percentage energy from fat is important in surveillance of populations and in epidemiologic studies examining relationships between diet and disease as well as for behavioral intervention studies seeking to change dietary behavior. The NCI percentage energy from fat screener (PFat) has adequately predicted percentage of energy from fat compared with 24-h recalls (24HR) in cross-sectional analyses. However, the instrument has not been evaluated for its ability to assess change of percentage energy from fat over time or in response to interventions to change dietary intake of fat. The objective of this analysis is to evaluate the performance of the PFat in assessing change in percentage energy intake from fat in a behavioral intervention setting. Four individual sites participating in the Behavior Change Consortium Nutrition Working Group administered both the PF at and multiple 24HR at baseline and follow-up to 278 participants. A measurement error model was used to assess agreement between the PFat and 24HR at baseline and follow-up. The PFat was consistent with 24HR in finding there was no significant change in percentage energy from fat as a result of the intervention. Both male and female participants in the intervention group demonstrated a significant increase in the correlation between PFat and 24HR from baseline to follow-up. Percentage energy from fat measured by PFat may be useful to provide estimates of change in mean intake of populations over time in longitudinal studies. Further methodologic research is called for in interventions producing significant changes and in diverse populations with adequate sample size. J. Nutr. 138: 212S–217S, 2008.

Introduction
Based on evidence linking total caloric intake to health, the National Health Objectives for Healthy People 2010 (1) indicate that Americans need to reduce their consumption of total energy and balance their energy intake and expenditure to maintain or improve their health. In general, behavioral dietary intervention programs that have targeted weight management, weight loss, and a reduction in percentage energy from fat have effectively lowered risk for developing diabetes (2–4). Two recent trials, the Women’s Health Initiative (5) and the Women’s Intervention...
Nutrition Study (6), illustrate the potential impact of reducing the percentage energy from fat in the prevention and treatment of breast cancer (7). Taken together, there are many clinical and research settings in which measuring percentage energy from fat and its change is relevant. Specifically, the newest federal guidance from the Dietary Guidelines for Americans 2005 recommends total fat intake between 20 and 35% of energy (8). Therefore, accurate measurement of the percentage energy from fat and its change is important.

Self-reports of diet are typically used to assess dietary change in intervention studies because few biomarkers that accurately reflect intake are available and, for those few that do exist, such measures are often prohibitively expensive. The interviewer-administered 24-h dietary recall (24HR)\(^{14}\) provides relatively accurate and complete self-reported information about the individual’s diet for a given day and is feasible in diverse populations (9–11). However, because the interviewer-administered 24HR is costly and burdensome for both investigators and participants, FFQ or brief screener instruments with a more narrow focus on whole foods or a particular class of nutrient (e.g., fat) are typically employed (12). Several short fat screeners have been developed and evaluated in cross-sectional settings (13,14). In addition, a 13-item fat screener developed for the Prostate Cancer Prevention Trial was evaluated in male participants at baseline; this screener had a significantly lower correlation with the criterion 24HR than did an FFQ \(r = 0.51\) vs. \(r = 0.71\) (15).

Based on this finding, the investigators in that study recommended against the use of a short screener as the sole assessment instrument in intervention studies (15). Nonetheless, because of resource constraints, many behavioral dietary interventions continue to employ various short screeners to assess change.

A National Cancer Institute (NCI) short screener assessing percentage of energy from fat (PFat) but not the amount or type of fat has been developed and tested cross-sectionally at baseline in a cohort setting (the NIH-AARP Diet and Health Study (16)) and cross-sectionally at baseline in these Behavioral Change Consortium (BCC) sites (17). In these analyses, we sought to evaluate the ability of the PFat to assess change in percentage energy from fat intake in comparison to change in percentage energy from fat intake estimated from multiple 24HR across 4 intervention sites participating in the BCC. This is the first study to evaluate a short percentage energy from fat screener in an intervention setting.

### Methods

#### Study description

Four sites [University of Rhode Island (URI), Harvard School of Public Health (HSPH), Emory University, and University of Rochester (ROC)] administered both the 16-item PFat screener and multiple 24HR at baseline and follow-up. Additional information on study sites, the PFat tool, and the 24HR protocol are provided in Yaroch et al. (18). Briefly, in 3 of the 4 sites (not Emory), the baseline PFat was administered after enrollment into the intervention study but before randomization to usual care versus experimental care group. At the Emory site, the baseline PFat was administered after randomization. PFat was self-administered in 2 sites (Emory, ROC) and interviewer administered in 2 sites (URI, HSPH) at baseline and at follow-up. Up to 3 nonconsecutive 24HR were administered by telephone to each participant at baseline and at follow-up (total of 6 possible 24HR). Duration of follow-up was 12 mo at URI, HSPH, and Emory and 6 mo at ROC. Subjects (\(n = 278\)) who completed the PFat and 24HR at both baseline and follow-up time points were included in the analysis for this report.

**PFat.** PFat is composed of 16 questions, which ask about usual consumption practices in the past 12 mo. Frequency of intake is asked for 15 food groups, selected in earlier analyses to optimally predict intake of percentage energy from fat (16). One question asks about use of reduced-fat margarine. Portion size is not explicitly queried; however, the scoring algorithms assign gender- and age-specific median portion sizes in grams to each food group asked. Then gender-specific regression coefficients relating intake of each food group to percentage energy from fat are applied. Complete scoring information is available on line (19). Screener data were coded at each center and sent to URI for central processing.

**24HR.** Multiple nonconsecutive 24HR were administered by telephone to respondents by trained interviewers. Data collection and processing for Emory and HSPH were performed by the Diet Assessment Unit of the Cancer Prevention and Control Program at the University of South Carolina; for ROC by the Diet Assessment Center at Pennsylvania State University; and for URI by their staff. All sites followed the same protocol, including a preinterview mailing of a 2-dimensional food portion guide (20) and 3 nonconsecutive unannounced 24HR over a 3-wk period, including 1 weekend day. Of the 278 participants, 62% had 3 24HR at both baseline and follow-up, and over 92% had at least 2 at both times (\(n = 255\)). The University of Minnesota Nutrient Data System for Research (NDS-R), versions 4.05_33 and 4.06_34, was used to conduct, code, and process 24HR. Interviews were conducted by trained interviewers using the multipass approach interface of NDS-R. Interviews were reviewed by supervisors, and foods reported that were not on the nutrient database were added in consultation from the Nutrient Coordination Center (NCC) at the University of Minnesota. Coding quality was checked with built-in systems that flag extreme values. All individual recalls defined as unreliable by the interviewer were reviewed and exclusion confirmed by a dietician with experience in conducting/supervising NDS-R recalls and an author with similar credentials (G. W. Greene).

#### Intervention condition

A variable indicating whether or not dietary fat intake was a target of the intervention was created. Decreasing intake of fat was a primary target of the dietary intervention at 2 sites (HSPH and ROC). For the other 2 sites, Emory and URI, the intervention targeted FV intake, and because FV intake is inversely associated with fat intake (21), the intervention also encouraged a reduction in fat intake. Thus, these 2 types of interventions were considered fat interventions. At all sites, alternative, nondiet intervention targets (e.g., physical activity, smoking, usual care) or no-treatment controls were included in the design. URI, HSPH, and Emory had a no-treatment control group; URI also had an exercise-only control; and ROC had both usual care (received results from a cholesterol screening, but no active diet or other counseling) and smoking cessation control groups. For the purposes of these analyses, controls were defined as those participants who received no intervention or a nondiet intervention.

#### Analytical procedure

Demographic data for the sample of 278 were computed by gender. The distributions of both PFat- and 24HR-derived estimates of percentage energy from fat were approximately normal. Therefore, data are presented as the mean and its standard error by gender and treatment group at both baseline and follow-up, controlling for site. The mean difference between instruments (PFat – 24HR) was tested at each time point by gender and treatment group, controlling for site, using a paired \(t\)-test. Although true usual intake is not observable in free-living populations (21), we can estimate the distribution of true intake in the population by use of appropriate reference data and statistical methods. Our reference instrument is multiple nonconsecutive 24HR. We used a measurement error (ME) model, described in Freedman et al. (22), to

---

\(^{14}\) Abbreviations used: 24HR, 24-h dietary recalls; BCC, Behavioral Change Consortium; HSPH, Harvard School of Public Health; ME, measurement error; NCC, Nutrition Coordinating Center; NCI, National Cancer Institute; NDS-R, Nutrient Data System for Research; NWG, Nutrition Working Group; PFat, National Cancer Institute short screener assessing percentage of energy from fat; ROC, University of Rochester; URI, University of Rhode Island.
estimate the relation between true intake (a latent construct derived from 24HR) and the PFat, assuming that the reference instrument (24HR) was unbiased at the individual level and contained only within-person error (23). Adjusting for ME, we estimated the overall level of agreement as the correlation (\( \rho \)) between the screener and estimated true intake from 24HR. The ME model was fit at baseline and at follow-up in separate analyses. The correlation coefficients were compared using Fisher’s Z-transformation to test whether the correlation varied over time (24).

Before fitting the final ME models, multiple ME models were fit to evaluate the influence of site and gender, and these models were compared using a likelihood ratio test. Although correlations varied by site and gender, our primary interest was to evaluate PFat, by gender, in the context of an intervention. As a result, site was fit as a control variable in all ME models. Before analysis, values of percentage energy from fat from each instrument were examined to identify outliers (i.e., for each gender, values deviating either more than 3 times the equivalent of the interquartile range below quartile 1 or above quartile 3 of that variable’s distribution were defined to be outliers); none were found. Subsequent to fitting cross-sectional ME models, diagnostic statistics were used to identify influential observations both as baseline and at follow-up. Three observations were identified in the baseline stratum for women that had a significant impact on the estimate of \( \rho \). When these 3 subjects were excluded, \( \rho \) changed by 45%; ME results are presented excluding these 3 subjects (\( n = 275 \)).

One way to look at the ability of an instrument to measure change is to see if it captures the treatment group effect as well as the referent measure does. To evaluate this capability, an ANCOVA approach that is commonly employed in a pretest posttest setting was used (25). Models were run separately for each instrument, regressing the follow-up measure of fat intake on a design variable for treatment group while controlling for baseline levels of the outcome variable and site.

**Results**

Table 1 provides demographics by gender for the analytic sample and demonstrates, as was seen in the overall sample (18), heterogeneity between genders in age (a larger proportion of men were older), race/ethnicity (higher percentages of women were African American and Hispanic), and smoking status (more men were current smokers at baseline). Characteristics of the small sample providing multiple 24HR at both time points were similar (data not shown). At baseline, 66% of subjects were randomized to some type of intervention group [e.g., diet, tobacco cessation, physical activity (18)], whereas 52% overall received a fat intervention message. The requirement for both 24HR and screener at both baseline and follow-up led to a reduced sample size. Because interventions were implemented at the site level, treatment and control participants were not evenly distributed across sites. URI had 96 participants (28 male and 68 female), HSPH had 48 women, Emory had 95 participants (11 male and 84 female), and ROC had 39 participants (17 male and 22 female).

In women, there was a consistent, statistically significant underestimate of the percentage of energy from fat for PFat relative to 24HR that averaged 1.5 at baseline and 2.0 at follow-up (Table 2). This underestimate was consistent at both baseline and follow-up for both treatment and control groups. In men, there was a nonsignificant underestimate at both time points, 1.4 at baseline and 1.5 at follow-up, and in the intervention group, 1.1 at baseline and 1.2 at follow-up. However, in males there was an underestimate in controls that was slightly larger (1.7) than in the intervention subjects (1.1) at baseline and significantly larger in the controls (2.4) than in the intervention subjects (1.2) at follow-up.

Table 3 presents cross-sectional (baseline and follow-up), deattenuated correlation coefficients between PFat and 24HR derived from the ME model. In general, the deattenuated correlation coefficients were of moderate size at both time points: for women, \( r = 0.45 \) at baseline and 0.51 at follow-up; for men \( r = 0.68 \) at baseline and 0.58 at follow-up. These correlations generally were 15–20% higher than the uncorrected correlations (i.e., not deattenuated with ME analysis). For example, the uncorrected correlations at both time points for women were \( r = 0.37 \) at baseline and \( r = 0.40 \) at follow-up, whereas for men they were \( r = 0.58 \) at baseline and \( r = 0.52 \) at follow-up. For the sample as a whole, there were no significant differences in the deattenuated correlation coefficients between baseline and follow-up for either men or women. However, when stratified by intervention status, for both men and women, the intervention group had a significant increase in correlation between PFat and 24HR in the follow-up assessment relative to baseline, whereas no significant differences in follow-up assessment relative to baseline were seen in the control group.

Table 4 tests for change between intervention and control participants for each instrument. Results for PFat were consistent with those from 24HR in that neither instrument detected significant between-group changes in intake of percentage energy from fat. In this sample, comparing intervention to control, we found no change in percentage energy from fat as measured by PFat and only a small, nonsignificant decrease from baseline to follow-up as measured by 24HR (Table 4).

**Discussion**

Several studies have employed both FFQ and 24HR and/or food records to assess change in fat intake in intervention settings.
Because all of these instruments have various biases, including those associated with the instrument, use of repeated measures, particular response sets associated with instrument characteristics (e.g., social desirability bias) (30), and biases associated with issues of compliance (10), some researchers have recommended that intervention studies use more than 1 instrument and look for consistency in the results (26,27). Some interventions do not have the resources to conduct intensive dietary assessment, so, although not ideal, they may rely on short screeners such as PFat to assess intake as one of many behavioral measures to help evaluate efficacy of their intervention. This is especially the case when an intervention seeks to change more than 1 behavior (e.g., decrease fat and increase fruit and vegetable consumption, smoking cessation), where multiple measures to assess behavior as well as psychosocial factors may be necessary but result in excessive response burden.

Looking at the data cross-sectionally at baseline and at follow-up, we found that PFat systematically underestimated fat intake relative to 24HR, ranging from 1.5% to 2%. Although the underestimate was slightly smaller among men than among women, small sample size and accordingly large standard deviations among men limited our ability to examine gender differences. Among women, the underestimate increased at follow-up, but only for controls. Moreover, even though the underestimate was greater in women in the intervention group than in the control group at both time points, for men there was a larger underestimate at follow-up in the controls than in the intervention group. The measures were moderately correlated and of similar magnitude at both times. However, for both men and women, deattenuated correlations between PFat and 24HR were higher at follow-up than at baseline for the intervention groups, whereas no difference was observed for the control groups. This pattern of intervention subjects being more likely than controls to report positive changes has been identified in previous studies of brief dietary instruments (26,32–34). It suggests that the act of participating in a dietary intervention program may increase awareness, knowledge, or salience of foods consumed, thus enhancing the quality of 1 or both dietary reports. Regardless of the explanation, this difference in agreement between treatment and control groups could bias estimates of dietary change in intervention

### Table 2

Estimated mean percentage of energy from fat at baseline and follow-up for PFat and 24HR and the cross-sectional difference between 24HR and PFat by gender and intervention group

<table>
<thead>
<tr>
<th>Gender/intervention</th>
<th>n</th>
<th>Mean</th>
<th>SE</th>
<th>Mean</th>
<th>SE</th>
<th>Mean</th>
<th>SE</th>
<th>Mean</th>
<th>SE</th>
<th>Mean</th>
<th>SE</th>
<th>Mean</th>
<th>SE</th>
<th>Mean</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>56</td>
<td>33.3</td>
<td>1.06</td>
<td>31.9</td>
<td>0.58</td>
<td>32.5</td>
<td>1.03</td>
<td>31.0</td>
<td>0.57</td>
<td>1.5</td>
<td>0.95</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>222</td>
<td>32.6</td>
<td>0.55</td>
<td>31.1</td>
<td>0.30</td>
<td>32.9</td>
<td>0.53</td>
<td>31.0</td>
<td>0.29</td>
<td>2.0</td>
<td>0.49</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>22</td>
<td>32.7</td>
<td>1.63</td>
<td>31.6</td>
<td>0.89</td>
<td>31.6</td>
<td>1.57</td>
<td>30.4</td>
<td>0.87</td>
<td>1.2</td>
<td>1.47</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>122</td>
<td>32.3</td>
<td>0.73</td>
<td>30.9</td>
<td>0.40</td>
<td>32.9</td>
<td>0.71</td>
<td>31.1</td>
<td>0.39</td>
<td>1.8</td>
<td>0.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>34</td>
<td>33.8</td>
<td>1.35</td>
<td>32.2</td>
<td>0.74</td>
<td>33.8</td>
<td>1.30</td>
<td>31.4</td>
<td>0.72</td>
<td>2.4</td>
<td>1.21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>100</td>
<td>32.9</td>
<td>0.78</td>
<td>31.4</td>
<td>0.42</td>
<td>32.9</td>
<td>0.76</td>
<td>30.9</td>
<td>0.42</td>
<td>2.1</td>
<td>0.70</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 n = 278; the mean and SE are estimated controlling for site.
2 The difference is calculated as PFat-derived value minus 24HR-derived value.
3 The difference is significantly different from 0; P < 0.05.

### Table 3

Deattenuated Correlation (r) between PFat and 24HR by gender and intervention group, at baseline and follow-up

<table>
<thead>
<tr>
<th>Gender/intervention</th>
<th>n</th>
<th>( \rho )</th>
<th>SE</th>
<th>95% CI</th>
<th>( \rho )</th>
<th>SE</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>56</td>
<td>0.68</td>
<td>0.20</td>
<td>0.29, 1.13</td>
<td>0.58</td>
<td>0.18</td>
<td>0.21, 0.99</td>
</tr>
<tr>
<td>Females</td>
<td>219</td>
<td>0.45</td>
<td>0.08</td>
<td>0.30, 0.62</td>
<td>0.51</td>
<td>0.08</td>
<td>0.36, 0.69</td>
</tr>
<tr>
<td>Males</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>22</td>
<td>0.77</td>
<td>0.36</td>
<td>0.03, 1.53</td>
<td>0.95</td>
<td>0.22</td>
<td>0.50, 1.47</td>
</tr>
<tr>
<td>Control</td>
<td>34</td>
<td>0.57</td>
<td>0.36</td>
<td>−0.17, 1.42</td>
<td>0.52</td>
<td>0.30</td>
<td>−0.09, 1.22</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>119</td>
<td>0.36</td>
<td>0.11</td>
<td>0.14, 0.61</td>
<td>0.59</td>
<td>0.11</td>
<td>0.37, 0.83</td>
</tr>
<tr>
<td>Control</td>
<td>100</td>
<td>0.45</td>
<td>0.10</td>
<td>0.24, 0.68</td>
<td>0.47</td>
<td>0.17</td>
<td>0.13, 0.87</td>
</tr>
</tbody>
</table>

1 n = 275; estimated with a measurement error model controlling for site.
2 Three women were excluded from this analysis because their data exerted undue influence on the model results.
3 The difference between baseline and follow-up is statistically significant at \( P < 0.05 \).
studies and calls for further study. If the bias occurs because the intervention subjects report their intake more accurately, it suggests that to detect whether an intervention creates real change in dietary intake, all trial participants should "learn" to use the measures before randomization. Thus, the performance of PFat varied by intervention status and indicates further need to understand and control for this bias. The performance also varied to some extent by gender, but the much smaller sample size for men may account for this difference and indicates that larger sample sizes are needed to confirm this bias.

The 4 BCC sites in this investigation did not produce significant change in the percentage of energy from fat as measured by 24HR; this finding was consistent with PFat, which also showed no change in percentage of energy from fat. Confirmation of a null intervention effect is important because scarce resources can then be more efficiently managed with regard to future program designs. However, more definitive testing is needed in intervention studies where significant changes in percentage energy from fat are produced and in studies with larger numbers of participants and from diverse samples.

Several limitations, both general and specific to this study, need to be acknowledged. Because of the lack of an objective biomarker for percentage energy from fat, researchers usually rely on self-reported dietary intake to characterize an individual's usual fat intake. Although the reference measure of multiple nonconsecutive 24HR may be considered a gold standard in self-report dietary assessment, it contains measurement error. In addition, error in 24HR may be correlated with error in PFat, potentially leading to an overestimate of the correlation between instruments (35). Other biases (e.g., selection bias, response set bias, and training effects) also could produce misestimates of true correlation coefficients (30,31,36). Specific to our study, 24HR would be administered over a much briefer time period than the 12 mo assessed by PFat; ideally, 24HR would be administered at several time points over the same 1-y interval assessed by the screener. Additionally, the 6-mo follow-up at 1 site creates overlapping periods of dietary assessment using the screener, which looks back over the past year. We examined this by rerunning the analyses excluding that site and found that the results were not appreciably different from those run on the entire sample. Another limitation is the small number of subjects completing both baseline and follow-up measures, reducing the analytical sample, especially among males. A concern with assessing the effects of a behavioral intervention is unexpected change in the control group. In this study, the control groups from several studies included subjects undergoing a tobacco cessation and physical activity. Change in these behaviors may occur in parallel with change in diet, thus reducing our ability to see an intervention effect. Finally, the influence of study site on the results could not be definitively analyzed because of the small sample size and the strong relationships between site and other sociodemographic variables such as age, gender, race/ethnicity, region, and education.

A major strength of the current study was its ability to administer both PFat and multiple 24HR in participants in 4 diverse intervention sites and at 2 different time points. This particular assessment design is needed for intervention studies, as information derived from cross-sectional or baseline data is inadequate to assess the performance of self-report diet assessment instruments to measure change in dietary behaviors.

In summary, PFat was consistent with the reference 24HR, showing no significant change in percentage energy from fat from baseline to follow-up. However, further studies are needed to assess PFat's ability to reflect change in interventions where percentage energy from fat does change in response to an intervention. Because of possible performance differences across samples and between intervention and control groups, these interventions should include adequate numbers in diverse study groups. Although PFat and other short instruments may offer a tempting resource to intervention researchers, caution must be exercised in their use. In dietary intervention studies focused on reducing fat components of the diet, more extensive assessment is still warranted, if feasible. An automated self-administered 24HR is currently being developed for public use (37), which may prove useful in intervention studies with limited resources.

**TABLE 4** Least-squares mean estimate of percentage energy from fat at follow-up by intervention status for 24HR and PFat

<table>
<thead>
<tr>
<th>Intervention/gender</th>
<th>n</th>
<th>24HR Mean</th>
<th>P-value</th>
<th>PFat Mean</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>144</td>
<td>31.9</td>
<td>0.39</td>
<td>30.0</td>
<td>0.99</td>
</tr>
<tr>
<td>Control</td>
<td>134</td>
<td>32.8</td>
<td>0.00</td>
<td>30.0</td>
<td>0.99</td>
</tr>
<tr>
<td>Males</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>22</td>
<td>30.7</td>
<td>0.19</td>
<td>29.3</td>
<td>0.51</td>
</tr>
<tr>
<td>Control</td>
<td>34</td>
<td>33.2</td>
<td>0.00</td>
<td>29.9</td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>122</td>
<td>33.1</td>
<td>0.46</td>
<td>30.8</td>
<td>0.19</td>
</tr>
<tr>
<td>Control</td>
<td>100</td>
<td>32.4</td>
<td>0.00</td>
<td>30.2</td>
<td></td>
</tr>
</tbody>
</table>

1. n = 278; least-squares means were generated from an Analysis of Covariance where the follow-up measure (24HR or PFat) was regressed on the treatment group, the baseline level of the outcome measure, and site.

**Literature Cited**


