Clustering of Multiple Healthy Lifestyle Habits and Health-Related Quality of Life among US Adults with Diabetes

Received for publication 12 December 2006 and accepted in revised form 1 April 2007.

Running title: Healthy Lifestyle and Quality of Life among Adults with Diabetes

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Disclaimer: The findings and conclusions in this article are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.
ABSTRACT

OBJECTIVE – We sought to examine the association between clustering of multiple healthy lifestyle habits (HLHs) and health-related quality of life (HRQOL) among adults with diabetes.

RESEARCH DESIGN AND METHODS – We analyzed the representative sample of the civilian, noninstitutionalized US population aged ≥18 years with diabetes using data from the 2005 Behavioral Risk Factor Surveillance System (n = 16,428). Four HRQOL measures were general health rating, physically unhealthy days, mentally unhealthy days, and impaired activity days. Three HLHs included not smoking, engaging in adequate leisure-time physical activity, and consuming ≥5 servings of fruits and vegetables per day.

RESULTS – The proportion of having 0, 1, 2, and 3 HLHs was 10.5%, 44.7%, 32.9%, and 11.9%, respectively. The age-adjusted prevalence rates of poor or fair health, ≥14 physically unhealthy days, ≥14 mentally unhealthy days, ≥14 impaired activity days were 43.07%, 27.61%, 17.22%, and 18.87%, respectively. After adjustment for potential confounders and compared to those with none of the 3 HLHs, people with all 3 HLHs were less likely to report poor or fair health (adjusted odds ratio [AOR], 0.49; 95% confidence interval [CI], 0.34 to 0.72), ≥14 physically unhealthy days (AOR, 0.57; 95% CI, 0.39 to 0.82), ≥14 mentally unhealthy days (AOR, 0.35; 95% CI, 0.23 to 0.55), or ≥14 impaired activity days (AOR, 0.36; 95% CI, 0.23 to 0.57).

CONCLUSIONS – Accumulation of multiple HLHs was significantly associated with better HRQOL among people with diabetes.
Diabetes mellitus is a common chronic disease, affecting approximately 20.6 million or 9.6% of adults aged ≥20 years in the United States in 2005 (1). People with diabetes mellitus have a particularly high risk of mortality and morbidity from coronary heart disease and stroke (2,3). Moreover, diabetes mellitus has been the seventh leading cause of death, and the age-standardized mortality rate for diabetes has increased by 45% from 1987 to 2002 in the United States (4). Health-related quality of life (HRQOL) is one of the key indicators for national health in Healthy People 2010 (5). It is also a global measure of perceived health and health burden among people with and without diseases or disabilities (6). Studies have shown that HRQOL is impaired among people with diabetes (7). Thus, improving HRQOL is a critical component of clinical management and public health services for people with diabetes.

Diabetic complications, diabetes-related comorbid conditions, severity, and unhealthy lifestyle habits have significant impact on patients’ quality of life (8-14). Effective control of diabetic complications and comorbidity through pharmacologic management and lifestyle modification may improve HRQOL among people with diabetes. The role of lifestyle modification in improving patients’ quality of life, however, is poorly understood. Not smoking (NSMK), getting adequate leisure-time physical activity (LTPA), and consuming ≥ 5 servings of fruits and vegetables daily (FVC5) have been recognized as 3 major healthy lifestyle habits (HLHs) because of their effective roles in primary prevention of cancer, cardiovascular disease, stroke, and diabetes (15-18). Studies have suggested that NSMK (19) and adequate levels of LTPA as recommended by the Centers for Disease Control and Prevention (CDC) and the American College of Sports Medicine (20) were strongly associated with increased quality of life in the general population (21). Few studies have provided direct evidence on the association between HLHs and HRQOL in diabetic populations. Limited data have shown that NSMK (12), LTPA (21), and fitness (12) were associated with a better quality of life among people with diabetes. Little is known about whether clustering of multiple HLHs may be associated with better HRQOL among people with diabetes.

The proportion of people who met the recommended levels of all 3 HLHs was only 5% among those without coronary heart disease and 7% among those with coronary heart disease in the United States (22). It is expected that the prevalence of having all 3 HLHs may be higher among adults with diabetes than in the general population because these healthy habits are important components of disease management (23). The goal of this study was to assess the association between clustering of multiple HLHs and HRQOL among US adults with diabetes in the 2005 Behavioral Risk Factor Surveillance System (BRFSS).

**RESEARCH METHODS AND DESIGN**

**Study setting and design**

BRFSS, an ongoing state-based and national surveillance system of behavioral risk factors and chronic disease conditions, is a standardized telephone survey conducted by state health departments with assistance from the CDC (24). Trained interviewers collect data on a monthly basis from an independent household probability sample in the noninstitutionalized US adult population (aged ≥18 years). A detailed description of the survey design and random-sampling
procedures is available elsewhere (24). According to the formula of the Cooperation Rate, the proportion of all cases interviewed of all eligible units that were actually contacted, the median response rate for the 2005 BRFSS was 75.1% (25). BRFSS data have consistently been found to provide valid and reliable estimates when compared to national household surveys in the US (26-28).

**HRQOL measures**

The 4 CDC HRQOL measures were derived from the original version of the Medical Outcomes Study 36-Item Short-Form Survey instrument (SF-36) (29-31) and have been validated in both healthy and disabled populations with acceptable criterion validity and reliability comparable to multiple-item SF-36 subscales (31-36). The 4 HRQOL questions were as follows: (1) “Would you say that in general your health is excellent, very good, good, fair, or poor? 1 = excellent, 2 = very good, 3 = good, 4 = fair, and 5 = poor.” (2) “Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?” (3) “Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?” (4) “During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?”

**HLHs**

Smoking status was determined by asking participants, “Have you smoked at least 100 cigarettes in your entire life?” and “Do you now smoke cigarettes every day, some days, or not at all?” NSMK was defined as either having smoked <100 cigarettes during a person’s lifetime or having smoked ≥100 cigarettes during a person’s lifetime, but not currently smoking. Moderate physical activity was assessed by asking participants 2 questions: “How many days per week do you do moderate activities for at least 10 minutes at a time?” and “On days when you do moderate activities for at least 10 minutes at a time, how much total time per day do you spend doing these activities?” Vigorous physical activity was assessed by asking participants 2 questions: “How many days per week do you do vigorous activities for at least 10 minutes at a time?” and “On days when you do vigorous activities for at least 10 minutes at a time, how much total time per day do you spend doing these activities?” LTPA was defined on the basis of CDC recommendations and federal physical-activity guidelines (20) (i.e., moderate physical activity for ≥30 minutes on ≥5 days per week or vigorous physical activity for ≥20 minutes on ≥3 days per week). FVC5 was defined as consuming 5 or more servings of fruits and vegetables daily, according to the national objective in *Healthy People 2010* (5).

**Diabetes, complications, and comorbid conditions**

Diabetes mellitus was determined by asking participants, “Have you ever been told by a doctor that you have diabetes?” Responses were coded as “yes,” “yes, but female told only during pregnancy,” or “no.” Gestational diabetes was coded as “no” diabetes. Age at onset of diabetes, use of insulin and oral agents, foot ulcer, and retinopathy were determined by participants’ self-reports. Body mass index (BMI; kg/m²) was calculated with the use of self-reported weight and height. According to the World Health Organization guidelines (37), we defined obesity as BMI ≥30 kg/m². Hypertension, high cholesterol, physical
disability, heart attack, angina or coronary heart disease, stroke, arthritis, and asthma were determined by asking participants whether they had ever been told by a doctor, nurse, or other health professional that they had such conditions.

**Statistical analysis**

We conducted analyses among men and nonpregnant women aged ≥18 years with diabetes. The prevalence estimates were calculated with use of the entire sample. The subsequent analyses for the association between clustering of multiple HLHs and HRQOL were limited to the subsample with available data for diabetes modules, which were conducted in 40 states (Appendix). Furthermore, we excluded participants with missing data for any of the demographic variables, HRQOL measures, HLHs, diabetes complications, and comorbid conditions. We calculated means for the general health rating and for unhealthy days by the number of multiple HLHs, adjusted for age. We performed direct age adjustment using the US population aged ≥18 years in the year 2000 (weights: 0.129, 0.183, 0.219, 0.299, and 0.170 for age groups 18–24 years, 25–34 years, 35–44 years, 45–64 years, and ≥65 years, respectively).

We dichotomized the responses for the self-rated general health question into poor or fair health versus good, very good, or excellent health. The 14-day cutoff point is often used as a marker for clinical depression and anxiety disorders in medical practice and research (38-40); therefore, it was used to dichotomize mentally unhealthy days as frequent mental distress (≥14 days) versus infrequent mental distress (<14 days) in our study. Physically unhealthy days and activity limitation days were also dichotomized at 14 days to be consistent with the cutoff point used for mentally unhealthy days and in line with previous studies (14,19,41). In addition, the 14-day cutoff value corresponds to the upper 10 to 15% of the distribution for the Healthy Days measures (14).

Logistic regression analysis was used to assess whether the clustering of multiple HLHs was independently associated with HRQOL measures. Odds ratios (ORs) and 95% confidence intervals (CIs) were estimated unadjusted and adjusted for age, sex, race or ethnicity, education attainment, annual household income, as well as duration, treatment, complications, and comorbid conditions of diabetes. The SUDAAN software (Release 9.0, Research Triangle Institute, Research Triangle Park, NC) was used to account for the complex sampling design.

**RESULTS**

The final analytic sample (n = 16,428; 49.3%) consisted of 52.8% men, 67.3% non-Hispanic whites, 13.5% non-Hispanic blacks, 13.2% Hispanics, and 6% other ethnic groups. The mean age of the diabetic participants was 58.9 years (SE, 0.11; range, 18 to 99 years). The mean duration of having diabetes was 9.6 years (SE, 0.08; range, 0 to 81 years).

The age-adjusted prevalence of diabetes (n = 33,320) among men and nonpregnant women aged ≥18 years (n = 356,112) was 7.8% (standard error [SE], 0.09), 7.9% (SE, 0.14), and 7.8% (SE, 0.11) in the total sample, among men, and among women, respectively. Non-Hispanic blacks (12.2%; SE, 0.35; P < 0.001) and Mexican Americans (8.1%; SE, 0.36; P < 0.001) had a higher prevalence of diabetes than non-Hispanic whites (7.2%; SE, 0.08).

Women had a higher prevalence of having all 3 HLHs (P < 0.05) than men (Table 1). No significant differences were found by racial or ethnic subgroups. Prevalence rates were similar in each age group (P > 0.05 for
linear trend). People with a higher level of
education ($P = 0.02$ for linear trend) or higher
annual household income ($P < 0.01$) had a
higher prevalence of having all 3 HLHs.

The age-adjusted means of the general
health rating, physically unhealthy days, mentally
unhealthy days, and impaired activity days were 3.3, 7.9, 5.3, and 5.2,
respectively. The mean rating of general
health was 3.67, 3.42, 3.16, and 3.05 among
people with 0, 1, 2, and 3 HLHs. There was
approximately a 2-day decrease in physically
unhealthy days, mentally unhealthy days, and
impaired activity days with one unit increase
in HLH (Figure 1, A). The age-adjusted
prevalence rates of poor or fair health,
≥14 physically unhealthy days,
≥14 mentally unhealthy days,
≥14 impaired activity days
were 43.07%, 27.61%, 17.22%, and 18.87%,
respectively. There were statistically
significant linear trends between the
accumulation of multiple HLHs and the
prevalence of HRQOL measures (all
$P < 0.001$) (Figure 1, B).

NSMK was significantly associated
with having poor or fair health ($P < 0.001$),
having ≥14 mentally unhealthy days ($P <
0.001$), and having ≥14 impaired activity days
($P < 0.01$), but marginally associated with
having ≥14 physically unhealthy days ($P =
0.07$) (Table 2). LTPA was significantly
associated with all four HRQOL measures (all
$P < 0.001$). In contrast, FVC5 was not
significantly associated with any of the 4
HRQOL measures ($P$ values ranged from 0.21
to 0.94).

Accumulation of the 3 HLHs was
significantly associated with a decreased
likelihood of all four HRQOL measures (all
$P < 0.001$ for linear trends) (Table 2). NSMK
only, LTPA only, the combination of NSMK
and LTPA, and the combination of all 3
HLHs were significantly associated with all
four HRQOL measures (Figure 2). After

CONCLUSIONS
Using a large, nationally
representative sample, we demonstrated for
the first time that clustering of multiple HLHs
was strongly associated with better HRQOL
in the diabetic adults. This association
persisted after adjustment for demographic
and socioeconomic characteristics, diabetic
complications, diabetes severity, and
diabetes-related comorbid conditions.

Although NSMK or LTPA alone was
associated with a significantly better HRQOL,
a combination of NSMK and LTPA, or all 3
HLHs, appeared to further enhance the
association in this diabetic population. We
estimated that the prevalence of having all 3
HLHs (NSMK, LTPA, and FVC5) was
approximately 12% among US adults with
diabetes.

The role of not smoking, physical
activity, and fruit and vegetable consumption
in the primary prevention of cancer,
cardiovascular disease, stroke, and diabetes
has been widely investigated (15-18). Our
results provide evidence that people with
diabetes who report achieving recommended
levels for these HLHs also report substantially
better HRQOL. Among the 3 individual
HLHs, NSMK and LTPA had stronger effects
than FVC5 on HRQOL. Abstaining from
smoking or engaging in adequate physical
activity has been consistently related to
reductions in all-cause mortality and morbidity and mortality from cancer, cardiovascular diseases, stroke, and type 2 diabetes (15). Our results suggest that people with diabetes who did not smoke, or participated in physical activity reported about 2 fewer days per month in physically unhealthy days, mentally unhealthy days, and impaired activity days. We detected a significant association of FVC5 only with poor or fair health, a marginally significant association with ≥14 mentally unhealthy days in the past month, but no significant association with ≥14 physically unhealthy days or ≥14 impaired activity days. However, a combination of FVC5 with NSMK or LTPA appeared to have a stronger association with general health or physical health compared with the individual factors alone. Nevertheless, our findings do not negate the importance of sufficient fruit and vegetable consumption because of its important role in the primary prevention of cancer, cardiovascular diseases, and stroke (42-44).

Most previous studies focused on the protective effects of the HLHs individually. The role of clustering of these HLHs on primary or secondary prevention has rarely been examined. In a cohort study, a greater number of multiple low-risk factors (i.e., favorable diet score, nonsmoking, moderate to vigorous exercise ≥30 min/day, BMI <25 kg/m², and alcohol ≥5 g/day) was associated with a lower relative risk of coronary heart disease events (18) or type 2 diabetes (16). The significant linear trend for the relationship between clustering of multiple HLHs and a higher level of HRQOL as shown in our study suggests that accumulation of multiple HLHs may also be related to a better quality of life in secondary prevention in the diabetic population. In fact, the proportion of people who had 2 or 3 HLHs was less than half (approximately 45%) among people with diabetes as indicated in our study, and only 30% among people with heart disease (22). Therefore, further effort is needed to promote multiple HLHs in both healthy and diseased populations.

Several previous studies considered healthy weight (BMI between 18.5 and 25 kg/m²) as one of the HLHs in addition to NSMK, LTPA, and FVC5 (45-48). In some of these studies, more than 50% of the participants had at least 2 healthy habits and more than 20% of the participants had at least 3 healthy habits (45-48). In our study, we chose not to include healthy weight as an indicator of a healthy lifestyle habit because we believe that healthy weight is an outcome of behavior and obesity is an important risk factor or comorbid condition for diabetes, which was accounted for in all of our analyses.

Our study has several limitations. First, all measures in the BRFSS are self-reported and may be subject to information bias. However, the HRQOL measures have been validated in diverse populations and have excellent retest reliability (35). Smoking status, blood pressure, height, weight, BMI, and demographic characteristics were found to be highly valid and reliable. Physical activity and fruit and vegetable consumption were found to be moderately valid and reliable (49). In addition, misclassification bias for self-reported diabetes, diabetic complications, and diabetes-related comorbid conditions may be minimal in the present study because previous studies have shown a substantial agreement between self-report and medical records for diabetes, hypertension, myocardial infarction, and stroke (50). Because misclassification bias among self-reported measures in the present study appears to be nondifferential, our findings may underestimate the true association between clustering of HLHs and HRQOL.
Second, because BRFSS was a cross-sectional survey, we were unable to determine whether the observed linear trend for the relationship between clustering of HLHs and HRQOL measures was actually causal. It is possible that people with a better HRQOL are more likely to adopt HLHs, particularly LTPA. Therefore, if this association could be confirmed in future research using a prospective design or clinical trial, it may have meaningful implications in clinical practice and public health service to promote the recommended levels of the 3 HLHs and to substantially improve HRQOL in the diabetic population. Third, because impaired activity included self-care, work, or recreation, a slight construct overlap may be possible when examining the association of LTPA with impaired activity days. However, our results may not be influenced because all associations were adjusted for physical disability status, and similar patterns were replicated in the subsample of people free of physical disability.

In conclusion, the first goal of Healthy People 2010 is to help people of all ages increase their life expectancy and improve their quality of life. This goal may be particularly important among people with diabetes because disease severity, complications, and comorbid conditions greatly impair their quality of life. Our findings suggest that having 2 or more HLHs may be associated with patients’ quality of life more substantially than the single factors alone. Because less than half of patients with diabetes have achieved the recommended levels of 2 or more HLHs, greater efforts are urgently needed to promote the adoption of multiple HLHs among people with diabetes in the United States.

Acknowledgments
We thank the Behavioral Risk Factor Surveillance System state coordinators for their assistance in data collection.

Appendix
References


Table 1. Age-Adjusted Prevalence of Single and Combined Healthy Lifestyle Habits among US Adults with Diabetes Aged ≥18 Years, 2005 Behavioral Risk Factor Surveillance System

<table>
<thead>
<tr>
<th></th>
<th>Single HLH</th>
<th>Combined HLH</th>
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<tr>
<td></td>
<td>NSMK</td>
<td>LTPA</td>
</tr>
<tr>
<td></td>
<td>% SE</td>
<td>% SE</td>
</tr>
<tr>
<td>Total</td>
<td>78.4 1.5</td>
<td>40.0 1.6</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>78.4 2.4</td>
<td>23.9 2.6</td>
</tr>
<tr>
<td>Women</td>
<td>78.5 1.8</td>
<td>32.3 1.9</td>
</tr>
<tr>
<td>Race</td>
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<tr>
<td>Non-Hispanic white</td>
<td>75.8 1.9</td>
<td>41.5 2.0</td>
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<tr>
<td>Non-Hispanic black</td>
<td>84.3 1.7</td>
<td>36.3 3.4</td>
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<tr>
<td>Hispanic</td>
<td>80.6 4.6</td>
<td>38.7 4.6</td>
</tr>
<tr>
<td>Other</td>
<td>83.8 2.4</td>
<td>42.7 5.3</td>
</tr>
<tr>
<td>Age, y</td>
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<tr>
<td>18-29</td>
<td>71.6 5.8</td>
<td>45.0 6.1</td>
</tr>
<tr>
<td>30-39</td>
<td>75.1 3.9</td>
<td>45.9 3.9</td>
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<tr>
<td>40-49</td>
<td>72.8 1.9</td>
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<td>81.1 1.1</td>
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<td>60-69</td>
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<td>70-79</td>
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<td>25.1 2.6</td>
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<td>&lt; High school</td>
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<td>78.8 2.3</td>
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<tr>
<td>College</td>
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<td></td>
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<tr>
<td>&lt;15,000</td>
<td>68.9 3.7</td>
<td>36.0 4.0</td>
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<td>15,000 to &lt;25,000</td>
<td>73.0 3.7</td>
<td>36.0 4.0</td>
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<td>Income Level</td>
<td>SE</td>
<td>LTPA</td>
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</tr>
<tr>
<td>25,000 to &lt;35,000</td>
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<td>2.0</td>
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<td>3.1</td>
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<td>≥50,000</td>
<td>81.9</td>
<td>3.0</td>
</tr>
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</table>

SE = standard error. NSMK = not currently smoking, LTPA = leisure time physical activity, FVC5 = fruit and vegetable consumption ≥ 5 servings/day, HLH = healthy lifestyle habit.

* Participants who did not report annual household income were not included.
Table 2. Odds Ratios and 95% Confidence Intervals of Healthy Lifestyle Habits on Impaired Health-Related Quality of Life among US Adults with Diabetes Aged ≥18 Years, 2005 Behavioral Risk Factor Surveillance System

<table>
<thead>
<tr>
<th></th>
<th>Poor or Fair Health</th>
<th>Physically Unhealthy ≥14 Days</th>
<th>Mentally Unhealthy ≥14 Days</th>
<th>Impaired Activity ≥14 Days</th>
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<tr>
<td></td>
<td>OR</td>
<td>95% CI</td>
<td>OR</td>
<td>95% CI</td>
</tr>
<tr>
<td>NSMK (reference = no)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unadjusted</td>
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<td>0.52</td>
<td>0.73</td>
<td>0.68</td>
</tr>
<tr>
<td>Adjusted*</td>
<td>0.71</td>
<td>0.56</td>
<td>0.89</td>
<td>0.83</td>
</tr>
<tr>
<td>LTPA (reference = no)</td>
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</tr>
<tr>
<td>Unadjusted</td>
<td>0.51</td>
<td>0.45</td>
<td>0.59</td>
<td>0.50</td>
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<tr>
<td>Adjusted*</td>
<td>0.66</td>
<td>0.56</td>
<td>0.77</td>
<td>0.66</td>
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<tr>
<td>FVC5 (reference = no)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Unadjusted</td>
<td>0.92</td>
<td>0.79</td>
<td>1.07</td>
<td>1.06</td>
</tr>
<tr>
<td>Adjusted*</td>
<td>1.00</td>
<td>0.85</td>
<td>1.17</td>
<td>1.09</td>
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<td>Clustering of HLHs (reference = 0)</td>
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<tr>
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</tr>
<tr>
<td>1</td>
<td>0.62</td>
<td>0.49</td>
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<td>0.36</td>
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<td>0.39</td>
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<td>0.49</td>
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<td>0.65</td>
</tr>
<tr>
<td>3</td>
<td>0.49</td>
<td>0.33</td>
<td>0.71</td>
<td>0.56</td>
</tr>
</tbody>
</table>

OR = odds ratio; CI = confidence interval; NSMK = not currently smoking; LTPA = leisure-time physical activity; FVC5 = fruit and vegetable consumption ≥5 servings per day; HLH = healthy lifestyle habit.

* Adjusted for sex, race/ethnicity, age, education, annual household income, body mass index, hypertension, high cholesterol, myocardial infarction, coronary heart disease, stroke, arthritis, asthma, disability, duration of diabetes, foot ulcer, retinopathy, use of insulin and oral agents, and the other 2 HLHs.
† Linear trend.
‡ Adjusted for sex, race/ethnicity, age, education, annual household income, body mass index, hypertension, high cholesterol, myocardial infarction, coronary heart disease, stroke, arthritis, asthma, disability, duration of diabetes, foot ulcer, retinopathy, and use of insulin and oral agents.
**Figure legends**

**Figure 1.** Age-adjusted means (A) and prevalence (B) of impaired health-related quality of life measures by the number of multiple healthy lifestyle habits among adults aged ≥18 years, 2005 Behavioral Risk Factor Surveillance System. The healthy lifestyle habits included not currently smoking, adequate vigorous or moderate leisure-time activity, and fruit and vegetable consumption ≥5 servings per day.

**Figure 1.**

A. Days (mean, se)

- Physically unhealthy days: 10.9, 8.2, 8.3, 9.0, 6.0, 5.9, 6.7, 4.2, 4.0, 2.8, 2.9
- Mentally unhealthy days: 10.9, 8.2, 8.3, 9.0, 6.0, 5.9, 6.7, 4.2, 4.0, 2.8, 2.9
- Impaired activity days: 10.9, 8.2, 8.3, 9.0, 6.0, 5.9, 6.7, 4.2, 4.0, 2.8, 2.9

B. Prevalence (% (se))

- Poor or fair health: 0, 1, 2, 3
- Physically unhealthy ≥14 days: 10.9, 8.2, 8.3, 9.0, 6.0, 5.9, 6.7, 4.2, 4.0, 2.8, 2.9
- Mentally unhealthy ≥14 days: 10.9, 8.2, 8.3, 9.0, 6.0, 5.9, 6.7, 4.2, 4.0, 2.8, 2.9
- Impaired activity ≥14 days: 10.9, 8.2, 8.3, 9.0, 6.0, 5.9, 6.7, 4.2, 4.0, 2.8, 2.9
**Figure 2.** Odds ratios and 95% confidence intervals of multiple healthy lifestyle habits in relation to impaired health-related quality of life among adults aged ≥18 years, 2005 Behavioral Risk Factor Surveillance System. Data are odds ratios (AOR) and 95% confidence intervals (CI) adjusted for sex, race/ethnicity, age, education, annual household income, body mass index, hypertension, high cholesterol, myocardial infarction, coronary heart disease, stroke, arthritis, asthma, disability, duration of diabetes, foot ulcer, retinopathy, use of insulin and use of oral agents. NSMK = not currently smoking; LTPA = leisure-time physical activity; FVC5 = fruit and vegetable consumption ≥5 servings per day.
Figure 2.

A. Poor or fair health

B. Physically unhealthy $\geq 14$ days

C. Mentally unhealthy $\geq 14$ days

D. Impaired activity $\geq 14$ days