Type of Vegetarian Diet, Body Weight and Prevalence of Type 2 Diabetes

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Objective: We assessed the prevalence of type 2 diabetes in people following different types of vegetarian diets compared to non-vegetarians.

Research Design and Methods: Study participants were 22,434 men and 38,469 women who participated in the Adventist Health Study-2 conducted in 2002-6. We collected self-reported demographic, anthropometric, medical history and lifestyle data from Seventh day Adventist church members across North America. The type of vegetarian diet was categorized based on a food frequency questionnaire. We calculated odds ratios (ORs) and 95% confidence intervals (CIs) using multivariate-adjusted logistic regression.

Results: Mean BMI was lowest in vegans (23.6 kg/m²) and incrementally higher in lacto-ovo vegetarians (25.7), pesco vegetarians (26.3), semi-vegetarians (27.3) and non-vegetarians (28.8). Prevalence of type 2 diabetes increased from 2.9% in vegans to 7.6% in non-vegetarians; prevalences were intermediate in participants consuming lacto-ovo (3.2%), pesco (4.8%) or semi-vegetarian (6.1%) diets. After adjustment for age, gender, ethnicity, education, income, physical activity, TV watching, sleep habits, alcohol use and BMI, vegans (OR 0.51, 95% CI 0.40-0.66), lacto-ovo vegetarians (OR 0.54, 95% CI 0.49-0.60), pesco vegetarians (OR 0.70, 95% CI 0.61-0.80) and semi-vegetarians (OR 0.76, 95% CI 0.65-0.90) had a lower risk of type 2 diabetes than non-vegetarians.

Conclusions: The five unit BMI difference between vegans and non-vegetarians indicates a substantial potential of vegetarianism to protect against obesity. Increased conformity to vegetarian diets protected against risk of type 2 diabetes after lifestyle characteristics and BMI were taken into account. Pesco and semi-vegetarian diets afforded intermediate protection.
Vegetarian diets may play a beneficial role in promoting health and preventing obesity (1-3). Vegetarianism encompasses a spectrum of eating patterns, from diets that leave out all animal meats and products (vegan), to diets that include eggs, milk and milk products (lacto-ovo vegetarian) or even fish in addition to eggs, milk and milk products (pesco-vegetarian). A previous study has indicated that BMI increases when a wider spectrum of animal products are eaten. Specifically, the European Prospective Investigation found that BMI was highest in meat-eaters, lowest in vegans and intermediate in fish-eaters (4). The protective effects of vegetarianism against overweight may be due to avoidance of major food groups, displacement of calories toward food groups that are more satiating (5) or other factors.

Based on a review of experimental data, investigators have suggested that the portfolio of foods found in vegetarian diets may carry metabolic advantages for the prevention of type 2 diabetes (6). This notion has been confirmed in observational studies. In the Nurses Health Study intakes of red meat and processed meats were associated with increased risk of diabetes (7). In a study of Seventh day Adventists diabetes was less prevalent in vegetarian than non-vegetarian churchgoers (8). Likewise, Fraser reported a lower prevalence of diabetes in vegetarians than semi- or nonvegetarians (1) and Vang et al found that processed meat consumption was a risk factor for diabetes (9). However, these church-based cohorts were initiated in the 1960s-1970s and included primarily non-Hispanic whites. Furthermore, the type of vegetarianism or diabetes was not specified.

A pertinent question is whether vegetarian diets remain protective in current obesity-promoting environments and in diverse populations. We studied a Seventh day Adventist cohort that included about 25% Black subjects and that is characterized by vegetarian and non-vegetarian eating patterns. We hypothesized that more exclusively vegetarian diets e.g. vegan, lacto-ovo, or pesco-vegetarian diets are associated with lower prevalence of obesity and type 2 diabetes compared to semi- or non-vegetarian diets.

**METHODS**

**Study Population:** The Adventist Health Study-2 cohort, initiated in 2002-6, longitudinally follows 97 000 Adventist church members in the U.S. and Canada (10). Participants were recruited through their churches and were eligible if aged $\geq 30$ years and proficient in English. The study was reviewed and approved by the Institutional Review Board of Loma Linda University, Loma Linda, California and informed consent was obtained.

These analyses are based on cross-sectional data obtained at baseline. Data were collected from a 50-page self-administered questionnaire (11). The questionnaire included sections on illness, diet, physical activity, demographics, height and weight. Cases of diabetes were ascertained by asking whether a physician had ever diagnosed type 1 or type 2 diabetes and whether the respondent was treated for this in the last 12 months. Race and ethnicity were divided into Black (Black/African American, West Indian/Caribbean, African or other Black) and non-Black (White non-Hispanic, Hispanic, Middle Eastern, Asian, Native Hawaiian/other Pacific Islander or American Indian). Education was categorized to high school or less, some college and college or higher based on eight options. Income was categorized into earnings of $\leq 10000$, $11000-30000$, $31000-50000$ and $\geq 51000$.

**Assessment of lifestyle exposures:** The food frequency portion of the questionnaire covered 130 hard coded foods
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or food groups that are commonly consumed and space for about 50 write-ins and assessed the past year. For different food items there were 7–9 frequency categories. A standard portion size was given for each item, and subjects could select that or a smaller or larger portion. Previous validation of the questionnaire pertained to nutrients including vitamin, antioxidant and fatty acid intakes (12, 13). Vegetarian status was categorized by defining vegans as subjects that reported consuming no animal products (red meat, poultry, fish, eggs, milk and dairy products <1 time/month), lacto-ovo vegetarians consumed dairy products and/or eggs ≥1 time/month but no fish or meat (red meat, poultry and fish <1 time/month); pesco vegetarians consumed fish ≥1 time/month and dairy products and/or eggs but no red meat or poultry (red meat and poultry <1 time/month); semi-vegetarians consumed dairy products and/or eggs and (red meat and poultry ≥1 time/month and <1 time/week); while nonvegetarians consumed animal products (red meat, poultry, fish, eggs, milk and dairy products >1 time/week).

Physical activity questions were previously validated in non-Black and Black subjects (14, 15). These were separated into six intensity levels, including napping, lying down, and light, moderate, vigorous and extremely vigorous activity. Participants reported the amount of time spent in each type of activity on a normal weekday and on Saturday and Sunday. Moderate, vigorous and extremely vigorous activities were assigned scores of 4, 8 and 10, respectively, to represent the approximate metabolic equivalent unit values expended and were weighted according to the amount of time spent in each activity to estimate average daily energy expenditure (appendix). Participants reported average number of hours of sleep and hours per day of TV watching. Responses were divided into three categories (≤6, 7, and ≥8 hours of sleep and <1, 1-2 and ≥3 hours of TV watching).

Ascertainment Of Disease: A representative subgroup of 1 007 study subjects participated in a calibration study and provided blood samples for measurement of fasting serum glucose levels (16). The calibration sample was generated by a two-stage random selection method, involving church size and subjects within the church. Subjects who refused participation were replaced with individuals randomly chosen from the same church and matched by race, age and sex.

We used a fasting glucose level of 126 mg/dl or more to categorize subjects as probably diabetic. We attempted telephone interviews with subjects who despite glucose measurements <126 mg/dl reported a physician-based diagnosis of type 2 diabetes and subjects whose glucose measurement was ≥126 mg/dl but who did not report type 2 diabetes. Of subjects who had reported type 2 diabetes but had a low glucose level (n=55), all 44 who were contacted confirmed that they had type 2 diabetes, while 9 could not be reached and 2 were too deaf to understand the question. Of subjects who did not report type 2 diabetes but had a high glucose level (n=53), 38 had no knowledge of diabetes, were informed of diabetes by their physician after the questionnaire was administered, were informed only of a high or borderline glucose level or had not been treated in the past 12 months, one had diabetes but had skipped that page of the questionnaire, six were deceased and eight could not be reached.

Statistical Analyses: The allocation of subjects to dietary category required responses to 27 variables regarding meats, fish and poultry, dairy, and eggs. As on average we had about 7% missing data for any particular variable, multiple imputation was used to fill missing information. For about half of these variables we had a random subset of initially missing data filled in later
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by telephone and used this to guide the imputation (17). For other variables we assumed that the data were missing at random, which even if not quite correct will have little influence when the missing data rate is small (17). The imputation algorithm included age, gender, race and food groups (meat, fish, dairy, eggs). These food groups were sub-divided to blocks of variables where we had the random subset of filled in data and those where we did not (e.g. fish variables that were included in those later filled-in; fish variables not so included) for purposes of imputation. The imputation software used was the Hmisc package for R version 2.6.0 (18).

Chi-square and one way ANOVA were used to analyze categorical and continuous variables, respectively. Multiple logistic regression analysis was used to obtain ORs and 95% CIs of the relation between characteristics, diet and diabetes. All statistical testing was two-tailed. Analyses were performed using SPSS version 13.0.

RESULTS

There were 83,031 subjects whose questionnaire responses allowed categorization to a vegetarian or non-vegetarian diet. Of these 1,427 did not respond to the diabetes ascertainment question. A further 634 who reported treatment for type 1 diabetes were excluded, and another 14,124, 4,638, 317, 852 and 136 were missing data regarding physical activity, income, education, TV watching and sleep, respectively. This left 22,434 men and 38,469 women. Of these 60,903 subjects, 3,430 (5.6%) reported type 2 diabetes.

Table 1 shows that participants treated for type 2 diabetes differed from participants that did not report diabetes in a number of characteristics. Only 1,070 (1.8%) participants had smoked 1 or more cigarettes daily in the past 12 months.

The consumption of major food groups differed among the dietary groups, as defined (data not shown). The prevalence of type 2 diabetes increased incrementally among vegans, lacto-ovo vegetarians, pesco vegetarians, semi-vegetarians and non-vegetarians (Table 2). This increase was concomitant to an incremental increase in mean BMI in the respective dietary groups; additionally demographic and lifestyle characteristics differed among the dietary groups (Table 2). For BMIs ≥ 30, the prevalence of diabetes was 8.0% in vegans, 9.4% in lacto-ovo vegetarians, 10.4% in pesco-vegetarians, 11.4% in semi-vegetarians and 13.8% in non-vegetarians, indicating the same trend as in the entire population. For BMIs <30, the prevalences were 2.0%, 2.1%, 3.3%, 3.7% and 4.6% in the groups, respectively.

In multiple logistic regression analysis, vegan, lacto-ovo, pesco and semi-vegetarian diets were associated with a lower prevalence of type 2 diabetes (Table 3). The vegetarian diets were more strongly associated with less diabetes when BMI was removed from the analyses (Table 3).

COMMENT

The main finding was that vegan and lacto-ovo vegetarian diets were associated with a nearly one-half reduction in risk of type 2 diabetes compared to non-vegetarian diets, after adjustment for a number of socioeconomic and lifestyle factors, as well as low BMI, that are typically associated with vegetarianism. Pesco and semi-vegetarian diets were associated with intermediate risk reductions between one-third and one-quarter. These data indicate that vegetarian diets may in part counteract the environmental forces leading to obesity and increased rates of type 2 diabetes, though only vegan diets were associated with a BMI in the optimal range. Inclusion of meat, meat products and fish in the diet, even on a less than weekly basis,
seems to limit some of the protection associated with a vegan or lacto-ovo vegetarian diet. These findings may be explained by adverse effects of meat and fish, protective effects of typical constituents of vegan and lacto-ovo vegetarian diets, other characteristics of people who choose vegetarian diets, or a combination of these factors.

The notion that animal protein stimulates insulin secretion and possibly insulin resistance was proposed decades ago (19). However, a number of other dietary constituents are associated with protection against diabetes in observational studies or influence insulin sensitivity in food trials (6). Vegetarian diets are rich in vegetables and fruits, foods that reduce oxidative stress and chronic inflammation. The vegan group consumed about 650 grams/day of fruits and vegetables, about one-third more than the amount consumed by non-vegetarians (data not shown). Observational evidence has shown that these dietary constituents are associated with a reduction in type 2 diabetes of about 40% (6). Vegetarian diets contain substantially less saturated fat than non-vegetarian diets and saturated fatty acids have been shown to reduce insulin sensitivity, though a recent review concluded that some of the data supporting this idea was flawed (20). The vegetarian diet typically includes foods that have a low glycemic index such as beans, legumes and nuts. We did not calculate the glycemic load of the diets. Though low glycemic response diets are associated with less type 2 diabetes, cohort studies have not consistently found a relation between dietary glycemic index or load and risk of diabetes (21, 22); furthermore, whether the glycemic response causes diabetes is not established.

Protection against type 2 diabetes associated with vegetarian diets is partly due to the lower BMI of vegetarians (Table 3), where effects of diet when not adjusted for BMI were greater yet. Disentangling the effects of diet on insulin sensitivity independently of lower adiposity among vegetarians may be difficult. Only sparse data has investigated whether vegetarians matched to non-vegetarians in regard to adiposity differ in their insulin resistance or sensitivity. In a study that matched vegetarians and non-vegetarians, non-vegetarians had higher insulin, glucose and homeostasis model assessment values than vegetarians (23). Whether vegetarians and non-vegetarians were matched in regard to abdominal girth was not reported. The protective effect of vegetarianism in the current study was evident in individuals with BMIs below or above 30 kg/m², further strengthening the notion that independent effects of the diet are present.

Church attendees tend to have higher body weights than non-attendees (24) and increasing trends in BMI in the general population have also been observed among Adventists (data not shown). Vegans were the only church members whose mean BMI was less than 25 kg/m². Previous studies have reported a difference of about two BMI units between vegans and meat eaters (4). In the current study, the difference of five BMI units may indicate greater protection in current environments where a variety of high energy dense foods are available. Some evidence indicates a temporal relationship between initiating plant-based diets and leanness (2, 3) though a randomized study found that a vegetarian diet did not improve long term weight loss (25) As with most dietary trials, the participants’ compliance to the diet declined substantially over time.

The present cohort is likely to be more homogenous than general populations regarding non-dietary factors allowing comparisons between dietary groups to be less affected by other differences. This may be true regarding smoking and alcohol use, practices strongly discouraged by the church.
One of the major confounders of diet and disease associations in observational studies is cigarette smoking. As the participants were almost exclusively nonsmokers, the opposing effects of smoking on body weight and risk of type 2 diabetes were avoided. The cohort exhibited an unusually wide range of dietary exposures and included one of the largest numbers of vegans studied in any sample. The results are likely to be generalizable given that we found expected relationships between age, ethnicity, gender, BMI, physical activity, sleep and TV watching and diabetes.

**Study limitations:** Our data are cross-sectional and do not allow causal inference to be made. However, reverse causation is unlikely in that subjects diagnosed with diabetes would not be expected to differentially change their diet from vegetarian to omnivorous compared to subjects without diabetes. We were unable to assess physical activity for about one-sixth of the cohort as responses to one or more of the questions required for the calculation of metabolic equivalent units were missing. Food frequency questionnaires involve a certain degree of measurement error, however, ability to allocate subjects into a broad dietary pattern is probably very good. All variables were self-reported, however, our calibration study found evidence for good validity for the diagnosis of diabetes. Diabetes may have been underreported in the vegan and other vegetarians because of their lower BMIs, however, this is unlikely to affect the study conclusions substantially given the association we observed between diet and diabetes in individuals with BMIs both below and above 30.

The cohort was not representative of the general population, i.e. participants were church attendees. Members who choose vegetarianism are likely to be more compliant with other church tenets and to differ from non-vegetarians in regard to major determinants of type 2 diabetes. This was indeed the case in regard to some factors, e.g. non-vegetarian diets were associated with Black ethnicity, less education, more TV watching and fewer hours of sleep than vegetarian diets. On the other hand, non-vegetarians were younger, reported more physical activity and alcohol consumption, all established protective factors against type 2 diabetes. Nevertheless, the association between diet and type 2 diabetes remained strong after adjustment for these factors.

In conclusion, this study showed that all variants of vegetarian diets (vegan, lacto-ovo, pesco and semi-vegetarian) were associated with substantially lower risks of type 2 diabetes and lower BMIs than non-vegetarian diets. The protection afforded by vegan and lacto-ovo vegetarian diets was strongest.

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**APPENDIX**

Modweek, vigweek and extrweek are the average times spent on moderate, vigorous or extremely vigorous activity on weekdays; modSat, vigSat and extrSat are the corresponding times on Saturday and modSun, vigSun and extrSun are the corresponding times on Sunday. Daily physical activity in metabolic equivalents was then calculated as the sum of these activities.

\[
\text{Mod} = \frac{(\text{modweek} \times 5 + \text{modSat} + \text{modSun})}{7}; \\
\text{Vig} = \frac{(\text{vigweek} \times 5 + \text{vigSat} + \text{vigSun})}{7}; \\
\text{Extr} = \frac{(\text{extrweek} \times 5 + \text{extrSat} + \text{extrSun})}{7}; \\
\text{Daily physical activity in metabolic equivalents} = 4 \times \text{Mod} + 8 \times \text{Vig} + 10 \times \text{Extr}
\]
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Table 1 Distribution of participants by history of type 2 diabetes treated within 12 months in conjunction with nondietary variables.

|                                | Type 2 diabetes reported | Not reported | P-value |
|--------------------------------|--------------------------|--------------|---------|
| N                              | 3 430                    | 57 473       | <0.0001 |
| Age, years, mean (SD)          | 62.5 (11.8)              | 56.1 (13.7)  | <0.0001 |
| Female, %                      | 61.7                     | 63.3         | 0.0604  |
| Black, %                       | 32.5                     | 23.4         | <0.0001 |
| BMI, kg/m², mean (SD)          | 32.1 (7.1)               | 26.9 (5.7)   | <0.0001 |
| Physical activity, METS*, %    |                          |              | <0.0001 |
| 0-3.2                          | 38.6                     | 24.8         |         |
| 3.2-8.6                        | 23.2                     | 24.5         |         |
| 8.6-21.0                       | 20.6                     | 24.6         |         |
| >21.0                          | 17.6                     | 26.1         |         |
| Education, %                   |                          |              | <0.0001 |
| High school or less            | 26.0                     | 17.9         |         |
| Some college                   | 31.9                     | 27.6         |         |
| College or higher              | 42.1                     | 54.6         |         |
| Income, %                      |                          |              | <0.0001 |
| ≤ $10 000                      | 25.0                     | 19.5         |         |
| $11 000-30 000                 | 42.9                     | 36.3         |         |
| $31 000-50 000                 | 19.0                     | 23.6         |         |
| ≥ $51 000                      | 13.1                     | 20.6         |         |
| TV watching, %                 |                          |              | <0.0001 |
| None to < 1 hour/day           | 11.8                     | 27.0         |         |
| 1-2 hours/day                  | 42.9                     | 47.4         |         |
| ≥ 3 hours/day                  | 45.3                     | 25.6         |         |
| Sleep, %                       |                          |              | <0.0001 |
| ≤ 6 hours/night                | 39.4                     | 31.7         |         |
| 7 hours/night                  | 28.8                     | 36.8         |         |
| ≥ 8 hours/night                | 31.9                     | 31.5         |         |
| Alcohol, use in last 12 months, %| 7.1                      | 10.4         | <0.0001 |

Percentages might not total 100 because of rounding. *Metabolic equivalents.
Table 2. Unadjusted prevalence of type 2 diabetes and distribution of nondietary variables according to diet.

|                     | Vegan     | Lacto-ovo vegetarian | Pesco vegetarian | Semi-vegetarian | Non-vegetarian | P-value |
|---------------------|-----------|----------------------|------------------|-----------------|----------------|---------|
| N                   | 2731      | 20408                | 5617             | 3386            | 28761          |<0.0001  |
| Type 2 diabetes, %  | 2.9       | 3.2                  | 4.8              | 6.1             | 7.6            |<0.0001  |
| Age in years, mean (SD)| 58.1 (13.3) | 58.1 (14.1)       | 57.2 (13.8)     | 57.7 (13.6)     | 54.9 (13.2)    |<0.0001  |
| Female, %           | 60.1      | 62.3                 | 65.9             | 65.7            | 63.2           |<0.0001  |
| Black, %            | 19.9      | 12.5                 | 34.9             | 15.0            | 31.2           |<0.0001  |
| BMI kg/m², mean (SD)| 23.6 (4.4)| 25.7 (5.1)          | 26.3 (5.2)       | 27.3 (5.7)      | 28.8 (6.3)     |<0.0001  |
| Physical activity, METS*, % |          |                      |                  |                 | <0.0001        |<0.0001  |
| 0-3.2               | 24.8      | 26.3                 | 24.3             | 26.8            | 25.2           |<0.0001  |
| 3.2-8.6             | 24.7      | 25.8                 | 24.5             | 24.0            | 23.5           |<0.0001  |
| 8.6-21.0            | 24.8      | 24.6                 | 24.6             | 23.7            | 24.3           |<0.0001  |
| >21.0               | 25.7      | 23.3                 | 26.6             | 25.6            | 27.1           |         |
| Education, %        |          |                      |                  |                 | <0.0001        |<0.0001  |
| High school or less | 16.7      | 14.0                 | 17.2             | 19.1            | 21.7           |         |
| Some college        | 26.7      | 24.2                 | 26.1             | 28.5            | 30.7           |         |
| College or higher   | 56.6      | 61.8                 | 56.7             | 52.4            | 47.6           |         |
| Income, %           |          |                      |                  |                 | <0.0001        |<0.0001  |
| ≤ $10 000           | 27.8      | 21.1                 | 18.0             | 20.2            | 18.6           |         |
| $11 000-30 000      | 38.6      | 35.8                 | 34.4             | 38.0            | 37.4           |         |
| $31 000-50 000      | 18.3      | 24.2                 | 24.0             | 23.4            | 23.1           |         |
| ≥ $51 000           | 15.3      | 18.9                 | 23.6             | 18.4            | 21.0           |         |
| TV watching, %      |          |                      |                  |                 | <0.0001        |<0.0001  |
| None to < 1 hour/day| 49.5      | 36.0                 | 26.8             | 25.2            | 16.9           |<0.0001  |
| 1-2 hours/day       | 37.4      | 45.4                 | 50.2             | 48.7            | 48.6           |         |
| ≥ 3 hours/day       | 13.2      | 18.6                 | 23.0             | 26.1            | 34.5           |         |
| Sleep, %            |          |                      |                  |                 | <0.0001        |<0.0001  |
| ≤ 6 hours/night     | 25.8      | 25.3                 | 34.9             | 29.8            | 37.3           |         |
| 7 hours/night       | 38.3      | 39.8                 | 36.3             | 36.9            | 33.7           |         |
| ≥ 8 hours/night     | 35.9      | 34.9                 | 28.9             | 33.4            | 29.0           |         |
| Alcohol, last 12 months, % | 1.1      | 2.9                  | 7.1              | 8.6             | 17.1           |<0.0001  |

*Metabolic equivalents.
Table 3. Multiple logistic regression analysis of the relation between diet and type 2 diabetes.

|                          | Odds ratio* | 95% CI†  | Odds ratio‡ | 95% CI  |
|--------------------------|-------------|----------|-------------|---------|
| Age                      | 1.04        | 1.04-1.05| 1.03        | 1.03-1.04|
| Female vs male           | 0.67        | 0.62-0.72| 0.78        | 0.72-0.84|
| Non-Black vs Black       | 0.66        | 0.61-0.72| 0.64        | 0.59-0.69|
| BMI                      | 1.11        | 1.11-1.12|             |         |
| Physical activity, metabolic equivalents |             |          |             |         |
| 3.2-8.6 vs 0-3.2         | 0.85        | 0.77-0.93| 0.76        | 0.69-0.83|
| 8.6-21.0 vs 0-3.2        | 0.77        | 0.69-0.85| 0.65        | 0.59-0.72|
| >21.0 vs 0-3.2           | 0.65        | 0.58-0.72| 0.52        | 0.47-0.58|
| Education                |             |          |             |         |
| Some college vs high school or less | 1.00        | 0.91-1.11| 1.04        | 0.95-1.15|
| College or higher vs high school or less | 1.00        | 0.90-1.10| 0.95        | 0.86-1.05|
| Income                   |             |          |             |         |
| $11 000-30 000 vs <$10 000 | 0.87        | 0.80-0.96| 0.82        | 0.75-0.90|
| $31 000-50 000 vs <$10 000 | 0.77        | 0.68-0.86| 0.72        | 0.65-0.81|
| ≥$51 000 vs <$10 000     | 0.66        | 0.58-0.76| 0.61        | 0.53-0.70|
| TV watching              |             |          |             |         |
| 1-2 hours/day            | 1.31        | 1.16-1.47| 1.54        | 1.37-1.73|
| ≥ 3 hours/day            | 1.62        | 1.44-1.83| 2.26        | 2.01-2.54|
| Sleep                    |             |          |             |         |
| 7 hours/night vs ≤ 6 hours/night | 0.83        | 0.76-0.91| 0.77        | 0.71-0.85|
| ≥ 8 hours/night vs ≤ 6 hours/night | 0.94        | 0.86-1.03| 0.86        | 0.79-0.94|
| Alcohol                  |             |          |             |         |
| Use last 12 months vs none | 0.69        | 0.60-0.80| 0.64        | 0.55-0.73|
| Diet                     |             |          |             |         |
| Vegan vs non-vegetarian  | 0.51        | 0.40-0.66| 0.32        | 0.25-0.41|
| Lacto-ovo vegetarian vs non-vegetarian | 0.54        | 0.49-0.60| 0.43        | 0.39-0.47|
| Pesco vegetarian vs non-vegetarian | 0.70        | 0.61-0.80| 0.56        | 0.49-0.64|
| Semi-vegetarian vs non-vegetarian | 0.76        | 0.65-0.90| 0.69        | 0.59-0.81|

*Adjusted for all factors. †Confidence interval. ‡Adjusted for all factors except BMI.